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ABSTRACT

Water quality is an environmental issue that has received increased attention in recent years and for which there is now a variety of educational materials. This guide was developed by the Water Curriculum Needs Assessment Project to help curriculum coordinators select and develop water quality training programs and curricula. The initial sections of the guide provide information for setting up a program that includes nine key water quality education topics and major subtopics; nine water education goals for youth; science process/content and developmental stages; a discussion of environmental thinking skills, instructional format choices, and academic disciplines; five environmental education goals for youth water curricula; six instructional format choices for youth water curricula; and methods of how to use curricula to create a youth water education program. The following section, making up the major portion of the guide, provides summaries of 63 reviewed curricula. Final sections provide lists of State/Regional reviewed curricula by state and title; reviewed curricula from national organizations; unique support materials for youth water education; and selected bibliographies for further information. A chart summarizes the 63 reviewed curricula for inclusion or exclusion of water quality education topics, environmental education goals, and instructional format. (MDH)

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EDUCATING YOUNG PEOPLE ABOUT

Water

A GUIDE TO GOALS AND RESOURCES

with an emphasis on
nonformal and school
enrichment settings

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ELAINE ANDREWS AND THE COOPERATIVE EXTENSION NATIONAL REVIEW TEAM

Sponsored by the United States Department of Agriculture, Cooperative Extension Water Quality Initiative Team

EDUCATING YOUNG PEOPLE ABOUT WATER: A GUIDE TO GOALS AND RESOURCES WITH AN EMPHASIS ON NONFORMAL AND SCHOOL ENRICHMENT SETTINGS

Sponsored by the United States Department of Agriculture, Cooperative Extension under the direction of **GREGORY CROSBY**, National Program Leader for youth science education, and the Cooperative Extension Water Quality Initiative Team, **ANDREW J. WEBER**, Chair

The USDA Extension Service project to review youth water education needs was developed in support of youth and community water quality education goals of the National 4-H Environmental Stewardship Program and the USDA Cooperative Extension National Water Quality Initiative Team.

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INTRODUCTION TO THE GUIDE

Water quality is a critical environmental issue that has received deserved attention from educators in recent years. There are now a variety of educational materials for young people that can be used both in school and in after-school settings.

However, educators and youth leaders often do not have enough training to develop a water education program. They need help in including multiple objectives and information on curriculum activities for specific programs.

The Water Curriculum Needs Assessment Project addressed this problem. We summarized information about water curricula, provided guidance for federal investments in water curriculum development, and created a network among national groups and agencies which promote youth water education. The 1992 project produced the resources in this book.

Who should use this guide?

This guide is for professionals who design and develop water quality training programs and curricula, and for coordinators of water education programs. It

will help you select water curricula, education support materials and bibliographies. Coordinators can use it to make initial program decisions or to find complementary materials for a program that is already in place.

How to use this guide

Quick overview

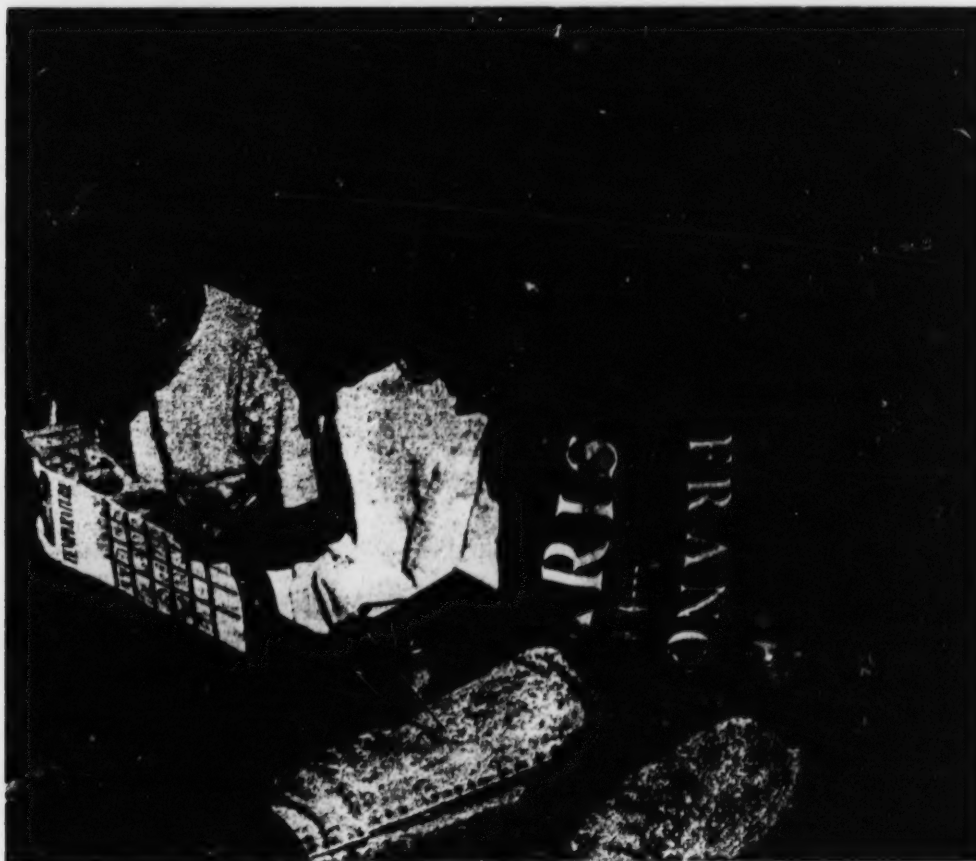
For a quick survey of water curricula useful in a local setting, start at the end of this book with the Youth Water Curriculum Summary. The chart summarizes each curriculum by topic or category.

Understanding subtopics

To understand the subtopics noted in the summary more clearly, look at "Key water quality education topics" and major subtopics and "Critical environmental thinking skills."

Specific curricula

You can learn more about any particular curriculum by finding its brief entry in the annotated "Guide to reviewed curricula." They are listed alphabetically by





title. For details about water topics, environmental education goals, and curriculum format choices in each curriculum, you will need to refer to a computer database developed for the project.
(See box, this page.)

Designing a local program

For help in designing or evaluating a local water education program, you may find the following book segments useful:

- *Water education goals for youth*
- *Key water quality education topics and major subtopics*
- *Critical environmental thinking skills*
- *Instructional format choices for youth water curricula*
- *Lists of sources of curricula chosen for review*
- *Unique support materials for youth water education*

Help us find what's missing

We reviewed many bibliographies and other resources to develop this guide. However, not every curriculum makes it to a regional or national bibliography. We may have missed high quality regional materials as well as curriculum resources that appeared since our study.

We are still collecting water quality curricula with educational activities for youth. If you have a copy of a curriculum that is not reviewed here and it covers topics listed in "Key water quality education topics" and subtopics we want to know about it.

Please send a copy of the curriculum or a description and ordering information to:

Elaine Andrews
University of Wisconsin-Madison
Environmental Resources Center
216 Agriculture Hall
1450 Linden Dr.
Madison, WI 53706
FAX: 608/262-2031

Thank you for your help.

RETRIEVING YOUTH WATER CURRICULUM INFORMATION ELECTRONICALLY

Requesting an "Almanac" guide

Detailed summaries of individual youth water curriculum and related documents are distributed via electronic mail from a computer at Purdue University that uses a document-distribution software package called "Almanac." To get a user's guide to Almanac, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put the following request in your message:

send guide

Requesting an electronic catalog

To get a catalog of the current youth water curriculum summaries, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put the following in your message:

send youth-water-curriculum catalog

You'll receive the catalog as an electronic mail message soon afterwards. You may request any or all catalog items via electronic mail. Be sure to type your requests exactly as you see them here.

Requesting one or more summaries

To get a summary listed in the catalog, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put your request in the message. For example, to request summary number 5, enter:

send youth-water-curriculum summary5

You may also abbreviate "youth water curriculum" to "ywc," and "summary" to "sum." For example:

send ywc sum5

Do not leave a space between "summary" or "sum" and the number you are requesting.

To request several summaries, put each request on a separate line in your message:

send ywc sum6

send ywc sum45

If you send several requests in one message, the requested files will arrive in one message. If you want to receive each request in a separate message, turn on the "separate option." For example:

set separate on

send ywc sum6

send ywc sum45

You'll receive three electronic mail messages. The first will confirm your "separate option" request, while the remaining messages will each contain one of your requested summaries.

What is the Internet?

The Internet is a rapidly growing, international computer network. Many institutions, both for-profit and non-profit, now offer services and products to their clients via the Internet.

To access the youth water curriculum summaries via the Internet, you need an electronic mail account on a computer attached to the Internet. All U.S. land grant universities provide computing facilities with electronic mail systems which can interact with Internet.

Commercial services such as CompuServe and MCIMail also support Internet electronic mail. Ask your computer center's staff for local instructions on how to send and receive Internet electronic mail.

If you don't have access to the Internet, contact your local county Extension youth development agent or state Extension youth development specialist in youth science and ask their assistance in retrieving the youth water curriculum catalog or summaries that you want.



USDA/Cooperative Extension Service

WATER CURRICULUM NEEDS ASSESSMENT PROJECT

Background

In 1988 state Cooperative Extension directors and administrators named water quality their highest national priority. These leaders head major county-based outreach programs at all 50 state land-grant universities. Cooperative Extension programs offer education to people of all ages in nonformal settings.

Water education became a focus for Cooperative Extension nationally. Leaders recognized that while people of all ages need to understand water quality issues, there were bonuses in working with young people. Young people could also learn about leadership, identify career opportunities, and improve their science knowledge.

The Cooperative Extension National Water Quality Initiative Team soon began to support curriculum development. In 1991, wanting to maximize their investment by targeting the greatest needs, they began the assessment project and set up a review group of experts from private and federal organizations.

The plan was to guide Cooperative Extension policy and summarize water curricula for national, state, and regional water education leaders. Nonformal education needs were central to the project because that is the type of education Cooperative Extension generally provides.

Review team

Water education is not new. Many government and private organizations have been involved in it for years. To benefit from their experience, we drew members of the national review team from these institutions. They are listed in the front of this book.

Team members supplied copies of water quality education materials for young people, provided references, and recommended other resources. They also helped identify appropriate water education goals and key topics, and offered strategies on how to address gaps and needs that we found. Their recommendations are found in *Assessing National Water Quality Education Needs for the Nonformal Youth Audience*, available from USDA Cooperative Extension, Washington, D.C.

Project goals

This study is unique because it begins with national water quality needs and issues rather than specific science or local resource education objectives. From these national resource policy issues we developed national goals and objectives for water quality education.

Water education materials are so many and varied it could take years to do a thorough assessment. To quickly meet educators' immediate needs for resources, we developed a short-term, initial project. The objective was to review and classify a selection of available curricula as a basis for understanding what was missing and needed. The results from this six-month study should provide a strong beginning for future work.

The specific objectives of this study were:

- 1) Use national water quality issues to identify key water quality topics and learning goals for youth in a nonformal setting (such as 4-H, for example).
- 2) Categorize a selection of water quality curricula according to the identified goals.
- 3) Classify relevant curriculum materials, delivery styles, and model programs in an easily understandable and accessible format.
- 4) Determine the strengths and weaknesses of available curricula, establish objectives for 4-H and youth water quality education, and provide direction for Cooperative Extension investment in curriculum development.

National water education needs

To determine national water education needs, we reviewed a number of federal and state Extension reports and national plans of work. We also reviewed reports from the U.S. Department of Agriculture, the U.S. EPA, the Great Lakes National Program Office, and the U.S. Geological Survey. Members of numerous federal agencies contributed to our National Review Team (see team list at beginning of book).

We sought the perspective of private organizations through a report by the Freshwater Foundation. Members of private organizations also served on the Review Team (see inside front cover).



This process produced four critical national water resource issues that nonformal education could address, and a list of nine key water quality education topics.

Critical water quality issues¹

- 1) Interaction of human activities and water quality.
- 2) Use and disposal of agricultural, industrial, and household chemicals.
- 3) State and local water problems such as drought-induced shortages, declining water tables, increased pumping costs, and increased production and treatment costs.
- 4) Protection for community water resource quality.

¹Adapted from: *Extension Review*, Vol. 59, No. 3, Fall 1988. Water quality issue

KEY WATER QUALITY EDUCATION TOPICS AND MAJOR SUBTOPICS

A wide variety of water education material has been available for the last ten years. It has not been easy for the educator, however, to choose the topics that help society meet its water quality goals or to find materials that teach those topics and concepts.

The National Review Team identified the nine key topics in the following chart. Discussion also produced a set of important subtopics. These add detail that the educator can use and that we used in reviewing curricula. They are listed here.

In reviewing curricula for this booklet, we looked only at whether the topics were present in the activities and information. We did not **evaluate** the quality of the activity or its relevance to the particular topic.

If you want to find activities about a specific topic, check the summary chart on page 42. There we indicate which topics are present in each curriculum. A computer database has a detailed listing of topics included in each curriculum (see "Introduction to this guide").

Key water quality education topics

1. the science of water
2. water related ecosystems
3. drinking water supply: quantity and quality
4. water use
5. sources of water pollution/contamination
6. water quality: risk assessment and reduction
7. management and protection strategies for specific uses
8. government and citizenship issues
9. water related careers





WATER QUALITY EDUCATION TOPICS AND MAJOR SUBTOPICS

As you select or develop activities and curriculum materials for water education, consider these water topics. This list will also help you better understand the curriculum summaries in the curriculum summary chart.

1. Science of water

- ☐ Properties
- ☐ Importance to living things
- ☐ Hydrologic Cycle
- ☐ Geology/hydrology dynamics
 - ☐ surface water
 - ☐ groundwater
 - ☐ regional supply

2. Water related ecosystems

- ☐ Types of ecosystems
 - ☐ lakes
 - ☐ wetland
 - ☐ estuaries
 - ☐ rivers
 - ☐ watersheds
 - ☐ ephemeral systems
 - ☐ ponds
 - ☐ oceans(intermittent)
 - ☐ streams
 - ☐ riparian
- ☐ Major regional resource: _____
(insert name)
- ☐ Ecological concepts

3. Drinking Water Supply: Quantity & Quality

- ☐ Delivery
 - ☐ community/public
 - ☐ private
 - ☐ treatment of drinking water
 - ☐ public drinking water
 - ☐ home treatment
- ☐ Water Quality Control
 - ☐ well concerns
 - ☐ testing
 - ☐ public
 - ☐ private
- ☐ Lifestyle impacts/conservation

4. Water use

- ☐ Use of water by many groups
 - ☐ commercial
 - ☐ municipal
 - ☐ recreation
 - ☐ industry
 - ☐ domestic
 - ☐ agricultural
 - ☐ power production
- ☐ Conservation by user groups
- ☐ Issues/conflicts between user groups

5. Sources of Water

Pollution/Contamination

- ☐ Point source
 - ☐ agricultural sources
 - ☐ public and/or private wastewater
 - ☐ industrial and business hazardous wastes
 - ☐ energy production wastes
- ☐ nonpoint source
 - ☐ atmospheric deposition
 - ☐ agricultural ☐ forestry
 - ☐ urban ☐ mining

6. Water quality:

risk assessment & reduction

- ☐ Curriculum addresses the concept of how risk decisions are made
- ☐ Impact of water quality on health
- ☐ Impact of water quality on human food sources
- ☐ Impact of water quality on plant and animal communities
- ☐ Understanding and reducing risks for specific contaminants
 - ☐ bacteria ☐ nitrates
 - ☐ pesticides ☐ salinity
 - ☐ sediments
 - ☐ other chemicals:
- ☐ Water quality indicators

7. Management & protection strategies for specific uses

- ☐ Zoning strategies
 - ☐ shorelands/floodplains
 - ☐ wetlands
 - ☐ wellhead/groundwater recharge areas
- ☐ Chemical storage
- ☐ Recreational use
- ☐ Wastewater treatment
- ☐ Solid waste management decisions
- ☐ Agricultural management practices
- ☐ Wildlife habitat/land stewardship management
- ☐ Natural disasters
- ☐ Chemical emergencies
- ☐ Development issues/pressures

8. Government & citizenship issues

- ☐ Policy issues
 - ☐ water quality
 - ☐ water quantity
- ☐ Role of local government in developing protection strategies
- ☐ Citizen involvement and participation
- ☐ Legislation, regulation, incentives/disincentives

9. Water-related careers

- ☐ Technical: _____
- ☐ Professional: _____

Water quality education topics and major subtopics was developed by Elaine Andrews and Karen Poulin, University of Wisconsin Cooperative Extension, Environmental Resources Center, 1992.



WATER EDUCATION GOALS FOR YOUTH

Young people and their families have an important role in protecting and enhancing the nation's water quality. To do so, they need opportunities to develop and apply two key understandings: water is vital to natural processes and human activities, and it is critical to the health of all living things.

The sample education goals which follow (grouped by key water education topic) are designed to help develop this understanding. They are a product of the curriculum review and deliberations by the National Review Team.

The goals are intended for nonformal education—learning that takes place outside school. In this setting the water education experience is based on the young person's personal or community life. While the formal school setting is probably a better place to teach the underlying science principles, nonformal activities offer a range of important experiences and skills:

- *learning by doing*
- *applying investigation skills*
- *evaluating alternative solutions to problems*
- *applying what is learned in real life situations*

These activities also contribute to a youth's general understanding of science, ecology, and human interaction with water systems.

Programs based on these goals can stand alone. They can also complement school programs or support a school enrichment activity. To determine how to fit goals to the age and developmental level of their youth audience, educators should refer to the chart Science/Process Content and Developmental Stages² which follows the goals.

1. Science of water

Youth will:

- explore observable physical and chemical properties of water and relate how those properties work together in the hydrologic cycle.
- identify where and in what conditions water is stored on the earth, recognize local water storage formations, explain the hydrology of any local formations, and recognize their interconnections. (For example, youth should be able to describe sources of water for a local estuary and identify characteristics that make an estuary a unique water storage area.)
- practice using observation, measurement, recording, prediction, and inference skills in studying the science of water. (Refer to the Science Process/Content chart for more detail on science skills.)

2. Water related ecosystems

Youth will:

- investigate and evaluate the environmental characteristics of a given water ecosystem, describe the plants and animals that inhabit the ecosystem, and research the importance of that ecosystem to those living things and to humans.
- identify sites in their community where the "natural" clean water cycle, including dissipation, biodegradation and filtration, is functioning.
- locate areas in their community where natural or human influences have changed a local water ecosystem for better or worse and document changes that have occurred. (Change can include anything from beaver dams or floods to pollution discharges or improvement from pollution prevention techniques.)
- practice using observation, measurement, data recording, prediction, and inference skills in studying a water related ecosystem

² Prepared by the Science Curriculum Framework and Criteria Committee under the direction of the California State Board of Education, Curriculum Development and Supplemental Materials Commission and adopted by the California State Board of Education.



3. Drinking water supply quantity and quality

Youth will:

- trace the path that water travels in order to serve humans in the local community. Steps include water's origin in surface and ground sources, movement to home wells or public storage facilities, to home treatment systems or public treatment plants, to home and industry uses, and eventually to its return into the natural environment.
- acquire and apply the skills needed to investigate the relationship between drinking water quality and human health and explain why private and public drinking water supplies must be tested for quality.
- view residential or public drinking water facilities and explain how treatment techniques help meet regulatory standards applied to water before its use.
- demonstrate their awareness of personal water use habits and provide leadership to involve their families and community in water conservation efforts.

4. Water use

Youth will:

- identify water related products and recreation experiences that are part of their lives.
- experience the aesthetic impact of a water resource on their lives.
- analyze how local water use decisions affect human lifestyles, quality of life, and standard of living.
- summarize the evolution of a local use of water, and interpret the impact of that evolution on the environment. Investigation of the local water use should identify any local doctrines of water ownership that apply to water use in their area and local use conflicts caused by changes in water demand. (Water uses which could be considered include: the historical increase in an urban population, evolution of commercial fishing or textiles industry, or use of water in food production processes over time.)

5. Sources of water pollution and contamination

Youth will:

- identify categories and sources of information about human actions which affect water quality in their community giving special attention to those which provide major sources of pollution.
- view residential or public wastewater treatment facilities and explain how treatment techniques help meet regulatory standards applied to water after its use.
- list local environmental factors which affect the potential of pollution sources to contaminate groundwater and predict land uses appropriate to protecting those factors. (Environmental factors might include soil types, geologic formations, proximity of water sources, height of water table, potential of flooding, climate factors, etc.)
- demonstrate their awareness of products used in home life which can contribute to water pollution if managed inappropriately and provide leadership to involve their families and community in efforts to protect water from contamination by those products.

6. Water quality: risk assessment and reduction

Risk assessment is used here in its broadest definition, rather than as the scientific assessment process used to develop pollutant regulations. However, understanding the risk assessment process is an important education goal.

Youth will:

- meet with representatives of regulatory agencies to learn about likely causes and effects (on humans, fish and wildlife) of pollutants found in their community that exceed advisory levels.
- investigate how people measure water quality changes over time and summarize what those measurements have indicated about local water quality. Understanding the change should include knowing how human behavior affects degradation, as well as historical improvement of local water quality.
- assess the relative environmental quality of a local body of water based on water quality parameters and the diversity of living organisms.



7. Management and protection strategies for specific uses

Youth will:

- identify local and regional agencies which monitor and control pollution caused by humans and observe the strategies and equipment they use to identify water quality problems and sources in their community.
- identify local and regional agencies which monitor and control natural disasters; interview professionals from these agencies to learn how to prepare for and prevent natural disasters related to water.
- demonstrate their understanding of best management practices which minimize the risk of water contamination from crop protection chemicals, by making farm visits and through farm management simulations.
- evaluate the effects of different kinds of land use on water habitats then describe and evaluate lifestyle change and community planning options that could minimize damaging effects.

8. Government and citizenship issues

Youth will:

- identify steps that they can personally take to prevent water pollution.
- identify appropriate questions and sources of information for evaluating a local water issue.
- practice using observation, measurement, data recording, prediction, inference, classification and problem solving skills to enhance their understanding of the science, community values, and policies of a local water issue.
- develop their own ideas about solutions to a local water issue by investigating and analyzing the science, community values, and policies that relate to that issue.
- demonstrate that they understand how, when, and where to communicate what they have learned about any positive or negative impacts of changing local conditions on the water resource.
- practice skills that enable them to act in direct response to what they have learned about water.

9. Water related careers

Youth will:

- identify and describe several careers related to the water resource and explain what they would need to do to prepare themselves for at least one of the careers.
- investigate the working conditions and salary level for two different water resource careers.



SCIENCE PROCESS/CONTENT AND DEVELOPMENTAL STAGES

Grade Level Content				Processes	Learners' Developmental Stages
9-12	6-9	3-6	K-3		
Usable Application Principles	Explanatory - Predictive, Theoretical Principles	Active - Relational, Interactive Principles	Static - Organizational Principles	Observing • Seeing • Hearing • Feeling • Tasting • Smelling	Sensory Motor
				Communicating • Silent • Oral • Written • Pictorial	Preconceptual
				Comparing* (includes measuring) • Sensory comparisons • Relative positive comparisons • Linear comparisons • Weight comparisons • Capacity comparisons • Quantity comparisons	Intuitive
				Organizing* • Data gathering • Data gathering • Sequencing • Grouping • Classifying	Concrete Operational
				Relating* • Using time-space relationships • Formulating experimental hypotheses • Controlling and manipulating variables • Experimenting	
				Inferring* • Synthesizing, analyzing • Generalizing • Recognizing and predicting patterns; stating laws • Formulating explanatory models and theorizing	Formal Operational
				Applying* • Using knowledge to solve problems • Inventing (technology)	

*These processes include the application of appropriate mathematical concepts and skills in interpreting data and solving problems.

Prepared by the Science Curriculum Framework and Criteria Committee under the direction of the California State Board of Education, Curriculum Development and Supplemental Materials Commission and adopted by the California State Board of Education.



ENVIRONMENTAL THINKING SKILLS, INSTRUCTIONAL FORMAT CHOICES AND ACADEMIC DISCIPLINES

Environmental education

In addition to learning about water, young people also need broader environmental problem solving skills, general science literacy, and awareness of water career options. The best way to learn these is through action and experience.

Because each person's choices and actions affect the environment, it is particularly important for young people to learn to think critically about and solve environmental problems. The Review Team based its choice of environmental education goals on the international effort to identify environmental education needs³ and on two taxonomies of environmental education objectives.^{4, 5} We also used Gardella's inventory forms to help verify the environmental education goals we selected.⁶

Environmental education goals adapted for use here include:

- ecological foundations
- conceptual awareness of environmental issues and skills
- investigation skills
- evaluation skills
- environmental action skills

Many skills listed for these areas also describe science literacy skills.⁷

Instructional format choices

Learning through experience is both vital to critical environmental thinking skills and easier to achieve in nonformal education. Furthermore, nonformal educators serve a diverse audience. We reviewed curricula for their attention to these needs.

Curriculum Development For Issues Programming,⁸ helped us develop a checklist for the instructional formats of curricula by offering a philosophical frame of reference. This document stresses experiential learning and is one of the few available that provides guidance on appropriate strategies for nonformal education. We also adapted ideas about practical strategies for experiential learning and environmental education from materials by the Minnesota Department of Education⁹ and Cornell Cooperative Extension.¹⁰

The following aspects of the instructional formats are important for teaching about water:

- applicable to diverse audiences (including gender, socioeconomic class and ethnic group)
- clear, accessible education goals and instructions
- student materials are varied and available
- uses indoor and outdoor/community environments
- types of activities are varied

Other disciplines

Academic disciplines other than science are relevant to understanding water's importance in our lives. For this reason, we noted whether social studies, math, language arts, and arts activities were present as we reviewed the curricula. When these disciplines are addressed, they are noted in the summary chart.

Curriculum review for these topics

We searched the reviewed materials for environmental education thinking skills. We noted them in the curriculum summary chart (on page 42) only if an environmental education topic or subtopic was present. We did not evaluate the quality of the activity or whether it was relevant to a particular audience.

Packaging styles, whether activities are designed for indoor or field use, and the disciplines addressed are also summarized in the chart. However, for a thorough assessment, we recommend you review the database (see "Introduction to the Guide.")

³Tbilisi Intergovernmental Conference on Environmental Education, 1978.

⁴Toward an Action Plan: A Report on the Tbilisi Conference on Environmental Education. A paper developed by the FICE Subcommittee on Environmental Education. Washington, D.C., U.S. Government Printing Office, Stock No. 017-080-01828-1.

⁵Hungerford, Harold, R. B. Peyton and R. J. Wilke, 1980. "Goals for Curriculum Development in Environmental Education," *Journal of Environmental Education*, 11(3):42-47.

⁶Roth, Charles, 1990. Definition and Clarification of Environmental Literacy, a working paper, ASTM Environmental Literacy Project, 1916 Race St., Philadelphia, PA, 19103-1187.

⁷Gardella, Ronald, 1986. "Environmental Education Curriculum Inventory Forms A and B." Northern Kentucky University, Highland Heights, Kentucky, 41076.

⁸Project 2061, American Association for the Advancement of Science, 1989.

"Science for All Americans, Summary," American Association for the Advancement of Science, 1333 H Street, N.W., Washington, D.C. 20005.

⁹Cantrell, Joy, 1991. Curriculum Development For Issues Programming, USDA Cooperative Extension, Draft.

¹⁰Minnesota Department of Education, 1991. Model Learner Outcomes for Environmental Education.

¹¹Cornell Cooperative Extension Service, 1989. Water Wise.



ENVIRONMENTAL EDUCATION GOALS FOR YOUTH WATER CURRICULA

As you select or develop activities and curriculum materials for water education, consider these environmental education skills. This list will also help you better understand the curriculum summaries in the summary chart.

1. Ecological foundations (materials focus on...)

- ☐ Individuals and populations
- ☐ Interactions and interdependence
- ☐ Environmental influences and limiting factors
- ☐ Biogeochemical cycling
- ☐ Community and ecosystems concepts
- ☐ Homeostasis (balance of nature)
- ☐ Succession
- ☐ Humans as ecosystem components
- ☐ Ecological implications of human activity

2. Conceptual awareness: issues & values (materials encourage recognizing...)

- ☐ Ecological impact of human culture on environment
- ☐ Ecological impact of individuals on environment
- ☐ Ecological and cultural implications of environmental issues
- ☐ Alternative solutions
- ☐ Cultural implications of alternative solutions
- ☐ Investigation as prerequisite to decision-making
- ☐ Role of human values and need for personal values clarification in decision making
- ☐ Need for responsible citizen action in environmental issue remediation

3. Investigation skills (materials provide opportunities to...)

- ☐ Shape questions
- ☐ Formulate hypotheses
- ☐ Make observations and measurements
 - ☐ natural science settings
 - ☐ social science settings
- ☐ Perform tests
- ☐ Analyze results with respect to:
 - ☐ ecological implications
 - ☐ cultural implications

4. Evaluation skills (materials provide opportunities to...)

- ☐ Identify alternative solutions
- ☐ Identify values associated with alternative solutions
- ☐ Evaluate alternative solutions with respect to cultural and ecological implications
- ☐ Identify and clarify personal values and positions as they relate to issues and solutions
- ☐ Change personal values and positions given new information

5. Environmental action skills (materials guide development of...)

- ☐ Skills to work towards ends consistent with individual values
 - ☐ community problem solving
 - ☐ consumerism
 - ☐ ecomanagment
 - ☐ education
 - ☐ legal action
 - ☐ persuasion
 - ☐ political action
- ☐ Decision-making regarding environmental action strategies
- ☐ Opportunities to apply environmental action skills
- ☐ Evaluate influence of actions taken to effect balance between quality of life and quality of environment



INSTRUCTIONAL FORMAT CHOICES FOR YOUTH WATER CURRICULA

As you select or develop activities and curriculum materials for water education, consider the following instructional format choices. They will help you select curriculum materials most appropriate to your youth group. This list will also help you better understand the information in the summary chart.

1. Grade level(s) _____

2. Applicability to Diverse Audiences (Materials are relevant to diversity with respect to...)

- ___ Gender
 - ___ language
 - ___ illustrations
 - ___ examples
- ___ Socioeconomic class
 - ___ vocabulary
 - ___ illustrations
 - ___ examples
- ___ Geographic region
 - ___ national audience
 - ___ regional audience: _____
- ___ Ethnicity
 - ___ language: _____
 - ___ illustrations
 - ___ examples
- ___ Special learning needs: _____

3. Instructional materials

Instructor materials

- Content:
- ___ background information
 - ___ stated goals & objectives
 - ___ lesson plan/teacher script
 - ___ answer keys
 - ___ resource list
 - ___ further study suggestions
 - ___ glossary
- Presentation style:
- ___ booklet: # pages _____
 - ___ computer software
 - ___ videotape
- Quality of printed materials:
- ___ clearly organized
 - ___ typed

Instructional materials

Student materials

- Content:
- ___ activity instructions
 - ___ worksheets
 - ___ tests
 - ___ text
 - ___ game materials
- Presentation style:
- ___ booklet: # pages _____
 - ___ teacher-made photocopies
 - ___ comic book
 - ___ magazine or newspaper
 - ___ other: _____
- Quality of printed materials:
- ___ age-appropriate visual layout
 - ___ clearly organized

4. Instructional environment

- ___ Indoor
 - ___ home
 - ___ classroom
 - ___ laboratory
- ___ Field
 - ___ natural site
 - ___ community facility/agency
 - ___ neighborhood

5. Lesson Type(s)

- ___ Seatwork
 - ___ discussion/debate
 - ___ worksheet
 - ___ demonstration observation
 - ___ reading text
 - ___ instructor/guest lecture
 - ___ audio/visual material
 - ___ letter writing/essays
 - ___ individual work
 - ___ team work
 - ___ computer software
 - ___ special equipment needed: _____ (list)
- ___ Activities
 - ___ field observation/measures
 - ___ laboratory experiment
 - ___ drama/artwork/models
 - ___ community project
 - ___ fairs and festivals
 - ___ home project/observations
 - ___ student presentations
 - ___ individual work
 - ___ team work
 - ___ games/puzzles
 - ___ special equipment needed: _____ (list)

6. Subject Area(s)

- ___ Science
- ___ Social Studies
- ___ Math
- ___ Language Arts
- ___ Art

Instructional format choices for youth water curricula developed by Elaine Andrews and Karen Poulin, University of Wisconsin Cooperative Extension, Environmental Resources Center, 1992.



CURRICULUM REVIEW: CHOICE AND PROCESS

There is a tremendous volume of material supporting youth water education. The first step was to develop a process for choosing those we would review.¹¹ A curriculum was included if it:

- *addressed one or more of our general or specific goals*
- *presented a planned education experience*
- *improved representation of: regional water concerns, varied water topics or environmental education goals.*

There were some materials which repeated much of another curriculum. We did not review these, but they are listed among supporting materials.

In reviewing these materials, we looked for whether the water topics, environmental education goals, and preferred formats were present. We did not review particular activities for their quality. The Youth Water Curriculum Summary is intended to show overall strengths and gaps in the body of available curricula.

The summary will also help instructors find curricula to meet their particular needs. One curriculum may have an outstanding selection of water science activities, for example, but little relating to water careers. A leader or instructor searching for water career activities would need to search further.

Another curriculum's activities may cover a broad overview of water topics but involves few environmental education skills. That curriculum may be fine for a science classroom, but may not be suitable for a school enrichment program.

Sources of curricula chosen for review

The curricula we selected to review are listed alphabetically by title in the curriculum summary chart. They are also listed separately in two categories: state/regional materials (including state Cooperative Extension materials), and national materials. Unique materials which were not reviewed are listed separately.

State and regional curricula come from 29 states. They include materials developed by Cooperative Extension 4-H programs, state agencies, and regional

agencies or groups. All regions are represented by at least one state. Many state-based curricula have a regional scope. They may adequately serve a nearby state which is not represented here or does not have its own materials.

National materials were prepared by national organizations or businesses or were designed to be used anywhere in the country. Such groups as American Water Works Association, Water Environment Federation, National Wildlife Federation, Project Wild, and the LaMotte Company, were among those producing these materials.

Unique programs, or program support materials which did not meet curriculum review criteria, were not reviewed in detail. Promising materials are listed as an additional reference. They may help provide a needed support piece, or form the basis for an innovative water education program.

¹¹For details on the selection process and inclusion criteria see: Andrews, E. 1992. *Assessing National Water Quality Education Needs for the Nonformal Youth Audience*. USDA, Cooperative Extension.



HOW TO USE CURRICULA TO CREATE A YOUTH WATER EDUCATION PROGRAM

Members of the National Review Team have a number of suggestions for professionals who create youth water education programs or experiences. The suggestions are based on the members' considerable experience in the area and not on a separate study of what makes nonformal water education effective.

A successful water education program should:

- *publicize available materials to appropriate educators*
- *train the educators*
- *package a selection of materials to meet local needs*
- *meet environmental education goals with creative programming strategies*
- *empower youth through communicating that improvement is possible*
- *create opportunities to learn environmental stewardship, not just human stewardship*

Publicity and training

In general water curricula are available but not well known. Most water topics are addressed in at least one curriculum, but you might have to spend considerable time searching for activities on each particular topic or skill. Instructors need help in identifying what water topics to emphasize and how to find suitable materials.

Instructors, be they volunteer leaders, 4-H agents or teachers, need time to learn about the materials. Most materials require some understanding of water science. Instructors also must be willing to read a lot of material before they choose a specific activity.

Home and community settings are excellent sites for studying water and many activities can be carried out there. Unfortunately, it is not easy for a home or community leader to adapt curricula for this use.

You will get the best results if leaders have training. It should focus not only on content, but also on the process of leadership and instruction.

Packaging materials

An ideal water education package might be based on one well-rounded curriculum, but complemented by several support pieces. The basic curriculum should offer a variety of activities, topics and levels.

Complementary pieces could include two types of resources:

- 1) materials specific to a regional water resource; and
- 2) drinking water quality materials (which are generally missing from most water education packages)

To introduce water careers, risk assessment or other concerns, you may have to develop supplementary materials locally.

As you choose materials, be sensitive to gender equity. Keep the socioeconomic and ethnic characteristics of your audience in mind. And consider any special learning needs.

Meeting environmental education goals

While school materials provide opportunities to learn ecological principles and practice investigation skills, the available curricula do not show young people how to apply what they have learned to their personal life decisions. You will need to find ways to bridge this gap.

Many curricula suggest home or school environmental actions, but few help young people take those actions.

Most curricula do not help young people ask their own questions about the impact on the environment of what they do at home or in the community. For example, a youth should be encouraged to ask and investigate questions about their own life such as: "Does being on a soccer team have anything to do with water quantity or quality?" or "Does playing with squirt guns have anything to do with water quantity or quality?"

It will take creative programming to address these and other needs for experiential education.

Empowerment and stewardship

As you design your water education experience, the National Review Team recommends that you think about two philosophical perspectives. First, the experience should encourage a sense of hope and empowerment to affect the future of our water quality. Second, it should encourage youth to understand that water is fundamental to the total living community, not just the human community.



One way to develop a sense of empowerment is to help young people appreciate their place in the historical context. They can visualize how their community has managed water quality in the past, what changes have already been made to improve future management, and what other changes may still be necessary to protect water quality. This should help them understand how human actions can improve environmental quality, not just cause damage.

The holistic perspective, which includes questions about implications for plants, animals and their ecosystems, can be enhanced by ensuring that youth go beyond the question of "what does this mean to me?" When they are done, they should be curious enough to ask "What does this mean to the future of our society and the earth?"

Choosing curricula for the nonformal setting

The nonformal or out-of-school setting offers excellent opportunities for young people to learn about water through real experience and action projects. There are many such nonformal settings: after school clubs, summer camp, nature center visits, church youth groups, and organized youth programs like Boy and Girl Scouts and 4-H.

Unfortunately, with few exceptions, most water curricula and support materials are not designed for nonformal settings. Some can be used with minimal preparation and modification. A few may be good models: they take the youth group through most of the nine water topics listed in this guide in a way appropriate to the nonformal setting.

QUESTIONS TO ASK ABOUT CURRICULA FOR THE NONFORMAL SETTING

Does the format:

- provide instructions in a brief form?
- allow easy separation of instructions from the activity?
- provide appropriate packaging to ensure that instruction materials are portable and long wearing?

Are concepts taught through a hands-on activity?

Does the activity provide a "hook" or appeal to a "teachable moment"?

Does the activity relate to the "world" of the youth who will do the activity?

- Is it appropriate to the interests, age, sophistication, gender, culture, socioeconomic status, and learning needs of the youth?

Can activities be provided independent of each other, i.e. can they stand alone?

Is the time requirement for the activity appropriate to the attention span of the age group and the time available in the nonformal setting?

Does the activity produce a product or result that enables the youth to communicate the concept that is learned?

Is the activity fun? Is there a reward for the learner, tangible or intangible?

Does the activity have a good probability of changing or influencing behavior?

Are materials easily available to most people?

- Are special required resources packaged with the materials?
- Do the materials assume ownership of special equipment such as a video cassette recorder, tape recorder, or computer?

Are the instructional methods easy to understand, organize, and carry out?

Can they be conducted without any special training or knowledge on the part of the leader?

Is the language used to describe the activity "user friendly," without educational jargon?

Does the activity actually work?

Is the purpose for any support items, such as charts, graphs, or illustrations, self explanatory and clearly related to the activity?

Is the activity appropriate to the setting where the activity will be used? The best use of a computer based learning program would be in a setting with low distractions and the opportunity to spend time with the materials.





To help you decide whether a particular curriculum can be used in the nonformal setting, refer to the questions listed here. These questions were suggested by practitioners of nonformal education who reviewed and discussed the curricula we selected. They have not been formally evaluated.

Suggested curricula for nonformal education

To help you narrow your search for curriculum materials to adapt to the nonformal setting, we offer a few examples. The list is not exclusive and we have not tested the materials. See the curriculum summary chart for details about what topics each curriculum includes.

Easily adapted

- Aquatic Wild
- Be Water Wise
- Connections to the Sea
- Local Watershed Problem Studies
- Our Great Lakes Connection
- The Story of Drinking Water
- Water Resources Education. Critical Issue: Water. You Can Make a Difference!
- Water Riches, Indiana version
- Water Magic
- Water Wizards

Adaptable with some effort

- 4-H Sportfishing Aquatic Resources Education Program
- Groundwater: A Vital Resource
- The Groundwater Adventure
- Instructor's Guide to Water Education Activities
- Stop, Look, and Learn
- Surface Water
- Teaching Aquifer Protection
- Water Wise
- Water Worlds

Unique resources

Nebraska Groundwater Foundation: Groundwater Festival and Children's Groundwater Festival Outreach packet

These provide an easily transferred model of a regional or statewide nonformal education program:

Ranger Rick's NatureScope, "Wading Into Wetlands" and "Diving Into Oceans"

Some of these activities are ideal for self learning. Others provide an excellent basis for designing a nature center or summer camp experience.

Unique programs or program support materials — not reviewed

These materials were either designed for the nonformal setting or could be adapted with minimal effort. We provide information on how to get these materials starting on page 34.

- The Changing Chesapeake
- Fishing for Fun and Learning
- Fishing . . . Get in the Habitat
- Friends - Special Water Edition, A Magazine for Young Readers From Georgia 4-H Clubs
- My Wetland Coloring Book
- Project Earthcare
- Responsible Angling. The Oregon Angler Education Manual
- Ranger Rick's NatureScope. Pollution: Problems and Solutions
- Water Can Be Fun! How to Create a Successful Science Fair
- Water Fun For You



A GUIDE TO REVIEWED CURRICULA

This section is a brief annotated bibliography of each curriculum reviewed for the project. We looked only for the presence or absence of specific water topics, environmental goals, or instructional format options. However, the process gave us an overview of each set of materials. We include a few comments about each curriculum to help you make your choices.

To find a curriculum about any particular topic or skill:

1. Scan the Youth Water Curriculum Summary, found at the end of this book, under the appropriate subject category.

2. Check related information such as age range or regional ecosystem addressed to eliminate inappropriate ones.

3. Review the annotated entry listed here. Curricula are listed alphabetically

For further details about subtopics, environmental goals, etc., access the computer database. Use the curriculum's unique identification number (001, for example).

RETRIEVING YOUTH WATER CURRICULUM INFORMATION ELECTRONICALLY

Requesting an "Almanac" guide

Detailed summaries of individual youth water curriculum and related documents are distributed via electronic mail from a computer at Purdue University that uses a document-distribution software package called "Almanac." To get a user's guide to Almanac, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put the following request in your message:

send guide

Requesting an electronic catalog

To get a catalog of the current youth water curriculum summaries, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put the following in your message:

send youth-water-curriculum catalog

You'll receive the catalog as an electronic mail message soon afterwards. You may request any or all catalog items via electronic mail. Be sure to type your requests exactly as you see them here.

Requesting one or more summaries

To get a summary listed in the catalog, send an electronic mail message to this Internet address:

almanac@ecn.purdue.edu

Put your request in the message. For example, to request summary number 5, enter:

send youth-water-curriculum summary5

You may also abbreviate "youth water curriculum" to "ywc," and "summary" to "sum." For example:

send ywc sum5

Do not leave a space between "summary" or "sum" and the number you are requesting.

To request several summaries, put each request on a separate line in your message:

send ywc sum6

send ywc sum45

If you send several requests in one message, the requested files will arrive in one message. If you want to receive each request in a separate message, turn on the "separate option." For example:

set separate on

send ywc sum6

send ywc sum45

You'll receive three electronic mail messages. The first will confirm your "separate option" request, while the remaining messages will each contain one of your requested summaries.

What is the Internet?

The Internet is a rapidly growing, international computer network. Many institutions, both for-profit and non-profit, now offer services and products to their clients via the Internet.

To access the youth water curriculum summaries via the Internet, you need an electronic mail account on a computer attached to the Internet. All U.S. land grant universities provide computing facilities with electronic mail systems which can interact with Internet.

Commercial services such as CompuServe and MCIMail also support Internet electronic mail. Ask your computer center's staff for local instructions on how to send and receive Internet electronic mail.

If you don't have access to the Internet, contact your local county Extension youth development agent or state Extension youth development specialist in youth science and ask their assistance in retrieving the youth water curriculum catalog or summaries that you want.



REVIEWED CURRICULA SUMMARIES

001

THE ADVENTURES OF WALLY, THE WATER MOLECULE

1991

Cost:

Chem Kids
25658 Ericson Dr.
Moreno Valley, CA 92553

A resource to aid teaching about the chemistry of water. Materials are designed to provide active learning opportunities for grades K - 3. An accompanying video assists instructors in learning to use active learning strategies. Some concepts and vocabulary contained in the learning activities may be too abstract for young children (e.g., volume, mass and density).

002

ALWAYS A RIVER: SUPPLEMENTAL ENVIRONMENTAL ED CURRICULUM ON THE OHIO RIVER & WATER

No copyright, publication available as of 1991

Cost: free

EPA Office of Research and Development
Center for Environmental Learning
Cincinnati, OH

This curriculum includes four primary objectives: to demonstrate that the Ohio River is part of a total ecosystem; to introduce the science of water and its importance to living things; to explore human use and environmental impacts of human activity; and to examine the influence of the river on historical and modern culture. The "Careers on the River" activity is unique—authors suggest holding a "career day." Includes appendices on making aquaria, guidelines for interviewing people, field ethics.

003

AQUATIC WILD

1992 (updated yearly)

Cost: free, available only to those attending a workshop

Project Wild
P.O. Box 18060
Boulder, CO 80308-8060
(303) 444-2390

This curriculum is a supplement to Project WILD, an inter-disciplinary, supplementary environmental and conservation education program emphasizing wildlife. Activities in this guide emphasize water habitats that support wildlife. Research data links use of Aquatic Wild activities with learning outcome. Instructors must complete a training program in order to receive materials.

Each activity is summarized according to student age, subjects, skills, duration, group size, setting, conceptual framework reference, and key vocabulary. Materials include suggestions for aquatic extensions of existing Project Wild instructional activities. Exceptional appendix materials, including:

- metric conversion chart
- use of outdoors as a classroom
- field ethics
- difference between observation and inference
- maximizing use of local resources
- interviewing guidelines
- guidelines for using guided imagery
- using simulations for instructional purposes
- keeping aquaria
- activities cross referenced by grade, subject, skills & topic, activity length, indoor and outdoor activities

004

BE WATER WISE

1983

Cost: Instructor's Guide, \$3.00; activity Guide, \$1.25 (prices include shipping)

Virginia Water Resources Research Center
617 N. Main St., VA Tech
Blacksburg, VA 24060-3397
(703)231-5624

The goals of this curriculum resource are to help users understand that water plays a critical role in our daily lives; help users understand why water should be used wisely; and make users more conscientious in responding to the need to conserve water. Materials include a student activity book for ages 12 and above in addition to the instructor's guide. The resource was designed for flexibility in use either as a school supplement or as a resource for other groups interested in water conservation.

005

CARING FOR OUR LAKES: A CURRICULUM ON THE YAHARA WATERSHED

1990

Cost: \$10.00 (includes shipping)

University of Wisconsin-Madison
Water Resources Mgmt.
Institute for Environmental Studies
550 N. Park St., 64 Science Hall
Madison, WI 53706
(608) 263-3064

A local curriculum that both demonstrates how a curriculum can be designed to further educational goals about a local water resource and includes aspects that are applicable to any community which includes small lakes in its watershed. Goals for students to



achieve include: understanding lakes as part of a larger ecosystem; ability to identify problems and issues concerning the Yahara lakes; familiarity with geography of the watershed; and recognition of human activities related to lake problems.

053

CAPTAIN HYDRO

1992

Cost: Student Handbook

\$0.50, 1-150,

\$0.43, 151-1500

Teachers Guide

\$2.00, 1-150,

\$1.75, 151-1500

(shipping is extra)

East Bay Municipal Utility
District

PO Box 24055

Oakland, CA 94623

(510)287-0138

Captain Hydro is designed for the middle school student and covers the water cycle—natural and built; the uses of water and water conservation and management. *The Further Adventures of Captain Hydro*, for grades 8 to 10, concentrates on world history and geography. Each topic in both materials is accompanied by a class activity. Materials are designed to be used in the classroom environment, but the authors recognize the benefit of experiences outside of the classroom and provide a variety of suggestions to make that possible. Field experiences are provided as "homework." Two simulation exercises in *Captain Hydro* help develop community problem solving skills, often missing in water curriculum. Water careers are addressed by recommending class speakers from specific professions. Very attractive publications.

006

**CHILDREN'S FESTIVAL
OUTREACH PACKET**

1992

Cost: \$20.00 (includes shipping
except for Nebraska residents)

Nebraska Groundwater
Foundation

P.O. Box 22558

Lincoln, NE 68542-2558

(402)434-2740

Designed to prepare a school class for the Children's Groundwater Festival. Activities were adapted from other curricula and put into a framework suitable for Nebraska water education needs. Includes activities which emphasize the impact that water hydrology and water in a natural setting has on people. On their own, these materials do not provide for a broad understanding of groundwater. Supplementary activities will be necessary. Packet includes: "groundwater basics," an instructional packet and 2 video supplements which provide additional activities. Source of video tapes is not specified in packet. Viewing video tapes is not an essential precursor to the supplemental activities.

064

**CONNECTIONS TO THE SEA,
A 4-H GUIDE TO MARINE EDUCATION**

1990

Cost: \$2.00

University of Maine
Cooperative Extension
Room 105

5741 Libby Hall

Orono, ME 04469-5741

(207)581-3877 or 800-287-0274

Materials focus on ocean ecology, hydrology, and pollution sources through student field investigations. Unique activities cover mapping and map reading, and environmental sensitivity. An extensive "related activities" sec-

tion includes activities for the visual arts, sea food, impact of the ocean on people's lives, environmental issues, and plant collections. A brief field guide to Maine Atlantic organisms is provided in the booklet. Materials do not specify an age, but appear to be designed for middle school through high school youth.

007

**DECISION-MAKING:
THE CHESAPEAKE BAY**

1985

Cost: \$14.95 (includes shipping)

Maryland Sea Grant College
Univ. of Maryland

1222 H.J. Patterson Hall

College Park, MD 20742

The major goal of this curriculum is for students to identify and analyze conflicting interests, issues, and public policies concerning the Chesapeake Bay, and to determine their effects on the people and their environment. Minimum lesson time is 15 sessions, though 5 components (introduction, videotape, simulation, reference source and application) can be used independently or incorporated into existing instructional units. Instructor training is required (just as with Project Wild).

008

DISCOVER WETLANDS

1988

Cost: \$10.00 (includes shipping)

Washington State Dept. of
Ecology

Wetlands Section

Mail Stop PV-11

Olympia, WA 98504

(206)459-6000

These materials were developed to enhance the ability of the Washington State Department of Ecology in preserving and managing wetlands in Washington. Activities address the definition of



a wetland, wetland field studies, the functions of a wetland, and human impacts of wetlands. The materials were designed to be taught either as a unit or integrated into existing curriculum.

Materials are activity based and applicable to other regions of the country. An interesting aspect of this material is that it focus on the idea that both action and inaction affect the outcome of environmental issues.

065

FLORIDA 4-H MARINE SCIENCE PROGRAM
1990

Cost: Copies no longer available, duplication permitted. Please mail requests to:

C.R. Miller
Rofls Hall
University of Florida
Gainesville, FL 32611

Objectives of the curriculum are to teach youth how to use simple field gear and to encourage understanding of relationships between ecosystem factors. Materials include: a leader's guide, a member's guide, a project guide, and a project record book. Leader and member guides provide guidance for conducting and evaluating field guides to six ecosystems. The member's guide provides background material on organisms found in ocean ecosystems. The project guide and record book complement the curriculum and are meant to be used while visiting an oceanarium. No age is specified for the materials, but seem designed for sixth grade and older. Activities are dependent on leader direction.

009

GEE-WOW! ADVENTURES IN WATER EDUCATION
"It's FOUND UNDERGROUND"
1991

Cost: booklet, \$10.00 + \$3.00 shipping; videotape, \$39.95 + \$4.00 shipping

Ecology Center
417 Detroit St.
Ann Arbor, MI 48104
(313) 761-3186

This curriculum was developed as part of the Groundwater Education in Michigan Program (GEM). The curriculum goal is to enable teaching of concepts related to water, groundwater, and pollution prevention. It includes 28 activities and a video. Lessons can be taught as a unit or used separately to supplement other classroom activities. Includes an index cross referenced by title, grade, subject area and activity type.

010

THE GREAT LAKES IN MY WORLD
Publication date not available
Cost: \$5.00 (includes shipping)

Lake Michigan Federation
59 E. Van Buren, Suite 2215
Chicago, IL 60605

Activities are designed to increase awareness and appreciation for the Great Lakes by including them in regular curriculum units for all disciplines. Activities cover cultural issues, current management concerns, and natural processes. Manual includes an index listing appropriate grade and subject area in which to include Great Lakes material.

011

THE GROUNDWATER ADVENTURE
1989

Cost: student workbook, \$1.25; teacher's guide, \$9.00; shipping for set \$3.75

Water Environment Federation
(formerly WPCF)
Public Education Dept.
601 Wythe St.
Alexandria, VA 22314-1994
(703) 684-2400

This curriculum is part of the Water Environment Federation's package designed to educate the public about important water quality issues. Topic materials are provided in a "building block" approach to allow flexibility in fitting the materials into an existing school curriculum. Each set includes a video and student activity guide. Activities in this set address how to clean up groundwater contamination in more detail than other curricula.

012

GROUNDWATER: A VITAL RESOURCE
1986
Cost: free

Tennessee Valley Authority
Office of Natural Resources
and Economic Development
Environmental/Energy
Education Program
Knoxville, TN 37902
Chattanooga Publications,
Carol Davis (615)751-7338

A series of 23 activities on four topics: the water cycle, water distribution in soils, water quality, and community impacts. Each topic includes activities for a range of ages. Strong technical/science orientation. Limited integration with daily life of the youth.



013

**GROUNDWATER EDUCATION
PROGRAM, PARTS 1, 2 & 3**
1984

Cost: free

East Michigan Environmental
Action Council
21220 W. Fourteen Mile Rd.
Birmingham, MI 48010
(615)632-2101

The purpose of developing these materials was to enhance groundwater quality through implementation of action-oriented groundwater programs at the local level. This is a curriculum designed for use as an in-school science unit, but was developed with the help of a 4-H extension specialist. Contents of this kit are comprehensive, including for each of the 3 parts: a teacher's guide, booklet with information and suggested activities, Arlegan County 4-H Resources catalog, equipment needed for classroom activities, as well as additional resources including other curricula, fact sheets and informational tests. Materials need to be adapted for younger end of suggested grade range.

014

**GROUNDWATER PROTECTION
CURRICULUM GUIDE
"GROUNDWATER - THE HIDDEN
RESOURCE" VIDEOTAPE**

1989

Cost: free

Missouri Dept. of Natural
Resources Office of Public
Information
P.O. Box 176
Jefferson City, MO 65102
(314) 751-3131

Information, video, and activity ideas designed to familiarize students with the source of their drinking water, the management of waste water, how groundwater becomes polluted, and how

groundwater pollution can be prevented. Information materials provide in-depth background about Missouri hydrogeology.

015

**GROUNDWATER RESOURCES AND
EDUCATIONAL ACTIVITIES FOR
TEACHING (GREAT)**

1989

Cost: notebook, \$8.00 or free with inservice; posters, 1 set free or \$7/set for multiple copies; groundwater models, 1 box/\$15.00 or 1 model free with inservice

Conservation Education Center
RR. 1, Box 53
Guthrie Center, IA 50115

Materials are arranged in 6 units with the first unit covering the basics of groundwater and hydrogeology in Iowa. The other five units cover Iowa's groundwater issues in priority order as agreed upon by Iowa groundwater interest groups. The five priorities are: fertilizers and pesticides, abandoned waste sites and landfills, leaking underground storage tanks and hazardous materials management, point source groundwater pollution, and land-applied wastes and sewage treatment. Curriculum should be accompanied by a set of 6 groundwater posters and a 1-foot plexiglass groundwater model. These cost extra.

016

DNR GROUNDWATER STUDY GUIDE
1991

Cost: \$10.50

Wisconsin Agency Document
Sales
Box 7840
202 S Thornton Ave
Madison, WI 53707
(608)266-3358

Resource packet and activity ideas. Activities focus on: the water cycle and hydrogeology, groundwater contamination, water and waste water treatment, water conservation, and groundwater use rights. Written materials may be challenging for younger end of suggested grade suitability range.

017

**A HIDDEN TREASURE. INSTRUCTIONAL
MATERIALS FOR GROUNDWATER
RESOURCE PROTECTION**
1992

Cost: free until initial run is exhausted; future price to be determined

National Vocational
Agriculture Teachers Assoc.
National FFA Foundation
P.O. Box 45205
Madison, WI 53744
(608)829-3105

Designed as a supplement for the school curriculum, these materials focus on the relationship between agriculture and groundwater. Includes unique sections on "Best Management Practices," groundwater protection in urban settings, managing underground storage tanks and water testing. Has students design management plan for proper lawn care. Covers both rural and urban issues.



018

**INSTRUCTOR'S GUIDE TO WATER
EDUCATION ACTIVITIES**

1986

Cost: 1 copy free

Commonwealth of
Pennsylvania Dept. of
Environmental Resources
Water Conservation/Technical
Assistance Program
P.O.Box 8761
Harrisburg, PA 19105-8761
(717)541-7800

Intended as a general water curriculum. Materials and activities integrate water science concepts with water use applications and impacts.

019

INVESTIGATING STREAMS AND RIVERS
1992

Cost: \$7.50 + \$1.50 shipping

Global Rivers Education
Network
216 S. State St.,#4
Ann Arbor, MI 48104
(313)761-8142

Recommended for use with "Field Manual for Water Quality Monitoring" by Mark K. Mitchell and Wm. B. Stapp. However, only activities 4 and 5 require use of manual. Unique in that activities provide a mechanism for learning some fundamentals of political action (eg, making contacts, group concerns about problem/issue of process, interview and phone skills, developing action plans.) Excellent guidance in developing, implementing and evaluating action plan. Activities would be complemented by participation in GREEN-sponsored computer conferences. Materials contain suggestions for using computer network to enhance student understanding. Manual includes user evaluation/feedback form.

066

**KIDS NETWORK - WHAT'S IN OUR
WATER?**

1992

Cost: kit for 30 students, \$375.00;
tuition and telecommunications,
\$97.50

National Geographic Society
Educational Services
PO Box 98018
Washington, D.C. 20090-8018
(202)857-7759 for information,
(800)368-2728 for ordering

Curriculum package includes *Teacher's Guide*, *Kid's Handbook*, *Software Manual*, and software for Apple IIGS. Computer and modem are required. National Geographic Kids Network is a telecommunications based science curriculum. The water unit emphasizes watershed studies. It is recommended for students in grades 4-6, but would also interest older students. Some units require relatively sophisticated skills which would seem more appropriate for seventh grade and up. Unit support materials include access to Hot Line staff and a "unit scientist," a professional who communicates to the class via electronic mail. Planned sessions require a minimum 15 hours of class time during a six-week scheduled communications calendar.

An unusual perspective of this curriculum is the idea that geographical and cultural qualities can influence water use. Extension activities provide opportunities for community studies and enable high quality experiential learning activities on many of the water topics emphasized in the classroom activities. This is also one of few curriculum to provide background for student understanding of risk decisions by providing an activity which evaluates the text and concentration of pollutants.

020

**LIVING IN WATER: AN AQUATIC
SCIENCE CURRICULUM**

1987

Cost: \$10.00 (includes shipping)

National Aquarium in
Baltimore
Dept. of Education and
Interpretation
Pier 3, 501 E. Pratt St.
Baltimore, MD 21202

Activities focus on a scientific study of water, aquatic environments and the plants and animals that live in water. The curriculum covers both marine and freshwater habitats. The emphasis of the materials is on process rather than content. Unique aspects of this curricula include answer keys that are provided in language students would be likely to use, and activities which teach students about describing something they can't see by measuring it and correlating their data. Many appendix materials are provided to facilitate ease of teacher preparation/presentation (over 100 pages).

021

**LOCAL WATERSHED PROBLEM STUDIES -
ELEMENTARY SCHOOL CURRICULUM**
1982 ?

Cost: \$7.75 (includes shipping)

University of Wisconsin
Water Resources Center
1975 Willow Dr.
Madison, WI 53707
(608)262-3577

A collection of lessons written by teachers with a variety of backgrounds. Lessons vary in degree of detail. Focus is on interface between land use and water pollution. Includes instructions on how to build water testing equipment. Provides many stories and folklore examples to enhance student enjoyment of a particular topic and to support language arts education goals. Offers teaching



suggestions for use with both lower and upper elementary age students. The appendix includes suggestions for citizen and government action in controlling non-point source pollution in urban areas and rural areas, and a discussion on role of values in environmental education.

022

LOCAL WATERSHED PROBLEM STUDIES - MIDDLE AND HIGH SCHOOL 1982 ?

Cost: \$16.65 (includes shipping)

University of Wisconsin
Water Resources Center
1975 Willow Dr.
Madison, WI 53707
(608)262-3577

A collection of lessons written by teachers with a variety of backgrounds. Lessons vary in degree of detail. Focus is on interface between land use and water quality. Contains unique attitude survey form. Though developed for Wisconsin, simulation activities could be adapted for other locales. Lessons typically take from several days to several weeks of class meetings. Some units are not directly related to water issues.

023

LOS MARINEROS

Publication date not available.

Cost: \$15.00 (includes shipping)

National Oceanic and
Atmospheric Administration
Under Secretary for Oceans
and Atmosphere, Rm. 5128
14th & Constitution
Washington, D.C. 20230
(202)482-3436
Publication information
(805)966-7107

While providing basic education about marine science, activities focus on the local resource, the Santa Barbara Channel. Units

include physical characteristics of the channel, flora and fauna of the channel, human history of the channel, and marine policy. Materials were developed for a program predominantly reaching low-income minority students who have limited access to special programs. Activities are designed to increase self-esteem and increase career awareness. Materials include an interesting "invitation" activity that encourages development of group identity and arouses student excitement. Activities provide a good interface between school and non-formal settings. Appendices include suggestions for marine careers, marine educational resources, teaching sheltered English, and starting a marine education program. Materials include extensive material on marine flora and fauna.

067

MY WORLD, MY WATER AND ME! A TEACHERS GUIDE TO WATER POLLUTION CONTROL

Publication date not available

Cost: free

Association of Environmental
Authority
2333 Whitehorse-Mercerville
Rd.#4
Mercerville, NJ 08619

Curriculum emphasizes how water gets polluted and the impacts of pollutants on living things. It uses the arts extensively to convey human uses and impacts. Activity directions do not always make the connection between the specific activity and the overall objective of the curriculum. However, background information is supplied to enable the teacher to make the connections. Extension activities sometimes have a significant role in developing understanding for a particular concept. Materials use a unique strategy to tie all the activ-

ity concepts together. Students write a story, in sections, as the unit proceeds. The teacher or leader provides the story outline, a trip through the waste water system by students shrunk to one one-thousandth of their size. The students provide details and adventures for each step. Materials do not indicate which activities relate to which part of the story. Teachers will need to select activities most relevant to the aspects of the water pollution story they wish to emphasize.

024

NATURESCOPE: DIVING INTO OCEANS 1989

Cost: \$7.95 + \$2.95 for shipping

National Wildlife Federation
1400 16th Street NW
Washington, DC 20036-2266

Instruction in these materials is provided in a unique layout that, in several cases, could be used independently by the student. Activity descriptions are clearly explained and illustrated. Topics include the physical ocean, life in the ocean, life along the coastline, and human impacts. Each topic includes an activity for primary, intermediate, and advanced age ranges. Activities are not dependent on each other. Materials include some beautiful drawings of sea life. Excellent supplementary resource list.

025

NATURESCOPE: WADING INTO WETLANDS 1989

Cost: \$7.95 + \$2.95 for shipping

National Wildlife Federation
1400 16th Street NW
Washington, DC 20036-2266

Instruction in these materials is provided in a unique layout that, in several cases, could be used independently by the student.



Activity explanations are clearly explained and illustrated. Topics include: what makes a wetland, saltwater wetlands, freshwater wetlands, wetlands and people. Each topic includes an activity for primary, intermediate, and advanced age ranges. Activities are not dependent on each other. Excellent supplementary resource list.

026

**NORTH DAKOTA STATE UNIVERSITY
EXTENSION SERVICE - WATER
ACTIVITIES PACKET**
1988

Cost: \$.10 per fact sheet

ND State Univ. Extension
Service
Fargo, ND 58105
(701)237-8118

Youth activities are provided in a fact sheet format which provides background information and related activities on single water topics. Instructor materials provide more information about the topic and further studies ideas. Activities are provided as illustrations or examples of discussion topics.

027

OUR GREAT LAKES CONNECTION
1985

Cost: 1 copy free

UW Extension Environmental
Resources Center
1450 Linden Dr.
UW-Madison
Madison, WI 53706
(608) 262-0020

These materials were designed to enable the teacher to integrate activities about the Great Lakes into a regular classroom program. Ideas for the activities were provided by teachers and Great Lakes specialists. Materials emphasize use and development of a variety

of learning skills. Activities focus on the historical/cultural role of Great Lakes in people's lives. History, geography and economics form the basis of the content, but materials include some emphasis on pollution impacts and lake effects on weather and climate.

028

OUR GROUNDWATER
1992 (draft form)

Cost: check on availability

University of Vermont
Extension Service
(802)656-3258

One of 3 packets designed as a supplement to the classroom. The others are "Our Surface Water" and "The Water Around Us". Uses demonstrations to convey four main ideas about groundwater.

029

OUR SURFACE WATER
1992 (draft form)

Cost: check on availability

University of Vermont
Extension Service
(802)656-3258

One of 3 packets designed as a supplement to the classroom. The others are "Our Groundwater" and "The Water Around Us". Provides directions for a pond and a stream field trip and instructions on how to conduct a water quality survey.

030

PROJECT WATER WORKS
1990

Cost: \$25.00

American Water Works
Association
6666 W. Quincy Ave.
Denver, CO 80235
(303) 794-7711

Materials require a classroom setting and computer. Extensive preparation by instructor required. Emphasis on water science and water management. Water management section of software emphasizes importance of values in decision-making, yet identifies "right and wrong" answers to simulated water management scenarios.

031

A SENSE OF WATER
1984

Cost: \$10.00 + \$4.00 shipping

Southern Arizona Water
Resources Association
Tuscon, AZ

Materials provide a set of short activities which can be integrated into a variety of disciplines and grade levels. Activities are organized according to sections, including: dependency of life on water, the science of water including water ecology, climate, water distribution and use, pollution potential of water, and the role of water in culture. Each lesson is indexed by chapter reference, grade, subject, length of activity, concept, key vocabulary and credits. Includes suggestions for evaluation, subject and topic index. A unique perspective includes activities which address the concept that water of varying degrees of contamination may have uses other than drinking.



032

**SENSING THE SEA -
(K-1) & (2-3) (2 BOOKLETS)**

1978

Cost: \$2.00 per copy

Marine Education Center
VA Institute of Marine Science
Gloucester Point, VA 23062

Activities center around set-up and care of saltwater aquarium. Focuses on process skills of investigation (especially observation and hypothesis).

Unique aspects include use of the skill of questioning (unusual), mostly through teacher example and the use of divergent questions for which student proposes possible solutions rather than decidedly "correct" answers. Book 2 teaches difference between observation and inference.

033

**4-H SPORTFISHING AQUATIC
RESOURCES EDUCATION PROGRAM
(SAREP)**

1992 ?

Cost: member manual for each topic, \$2.50; fishing brochure, \$1.00; leaders manual, \$40.00. Leaders manual is provided free at training sessions. Manual currently in revision.

Cornell CES
Cornell University Media
Services
Ithaca, NY
(607)255-2814

These activities are designed to help "hook" kids with a broader message about aquatic resources and the need to respect and conserve them. They were intended to be used as the basis for 4-H club meetings and activities. Activities published individually in 20 separate booklets include almost everything about fishing from "how to fish" in a variety of settings to "minimizing your intake of fish contaminants." Note

explicit commitment to and focus upon affective learning. Binder contains all supplemental materials listed in Activity Booklets. Introductory chapters include teaching/leadership tips.

034

**STOP, LOOK AND LEARN ABOUT OUR
NATURAL WORLD VOL. 1 (WATER
SECTION ONLY)**

1988

Cost: \$30.00 per 3 volume set + shipping costs

Nebraska Natural Resources
Commission
Stop, Look and Learn
Box 94876
Lincoln, NE 68509
(402) 471-2081

Only lessons specifically related to water resources are included in this survey; thus it covers only Unit 2 of Volume 1 (27 of 216 pages). Other units cover soil, plant, tree, and wildlife conservation. Materials were developed with a resource conservation orientation. Worksheet instructions may be too advanced to be read independently by some k-2 students. Many activities combine content and study skills. Includes guide that references activities according to subject area, skill, page number, and topic.

035

**STOP, LOOK AND LEARN ABOUT OUR
NATURAL WORLD VOL. 2 (WATER
SECTION ONLY)**

1988

Cost: \$30.00 per 3 volume set + shipping costs

Nebraska Natural Resources
Commission
Stop, Look and Learn
Box 94876
Lincoln, NE 68509
(402) 471-2081

This survey reviews only material in Water Conservation Unit (49 pages). Other units in this 244-page booklet include soil, plant, tree and wildlife conservation. Materials were developed with a resource conservation orientation. Worksheet language may be too advanced to be read independently by some 3rd and 4th graders. Additionally, some 3rd and 4th graders may not have the math skills to complete or understand computations included in the materials. Many activities combine content and study skills. Includes guide that references activities according to subject area, skill, page number, and topic.



036

**STOP, LOOK AND LEARN ABOUT OUR
NATURAL WORLD VOL. 3 (WATER
SECTION ONLY)**

1988

Cost: \$30.00 per 3 volume set +
shipping costs

Nebraska Natural Resources
Commission
Stop, Look and Learn
Box 94876
Lincoln, NE 68509
(402) 471-2081

Reviewed unit on water conserva-
tion. Forty-four of book's 215
pages devoted specifically to
water conservation. See comments
about Volumes 1 and 2.

037

THE STORY OF DRINKING WATER

1992 (accompanying comic book,
1990)

Cost: teacher's guide, \$4.95 +
\$2.30 shipping; comic, \$26.

American Water Works Assoc.
6666 W. Quincy Ave.
Denver, CO 80235
(303)347-6206

A comic book about a variety of
water issues is provided for stu-
dents in English, Spanish and
French. The Teacher's Guide
includes 19 activities to provide
hands-on experiences with topics
mentioned in the comic book.
Intended for classroom applica-
tion. Excellent focus on plight of
third world countries, i.e., water
supply.

038

**THE STREAM SCENE: WATERSHEDS,
WILDLIFE AND PEOPLE**

1990

Cost: \$15.00 (includes shipping)

Oregon Dept. of Fish and
Wildlife
P.O. Box 59
Portland, OR 97207

One of few (if any) focusing on
riparian areas and intermittent
streams. Only one reviewed that
studies the effect of stream flow
(water quantity) on plant commu-
nities. One of few to approach
populations with strong mathe-
matical orientation. Includes
appendices on making field
equipment; a description of the
salmon-trout enhancement pro-
gram; general stream survey
terms; water resource agencies.
Includes science background for
instructors and activities for stu-
dents on any particular topic.
Material likely too advanced for
middle school students without
modification.

039

SURFACE WATER

1988

Cost: teacher's guide, \$9.00; stu-
dent guide, \$1.25; shipping for
both, \$3.75

Water Education Federation
601 Wythe St.
Alexandria, VA 22314-1994
(703) 684-2400

Teacher's Guide provides back-
ground information and activities
to complement the student video.
Student Guide provides addition-
al information about the water
cycle, sources of water pollution,
wastewater treatment, and citizen
action. Materials address the con-
cept of natural pollution; this is
fairly unique.

040

THE TAPWATER TOUR

1989

Cost: \$39.95

LaMotte Co.
P.O. Box 329
Chestertown, MD 21620
1-800-344-3100

Activities enable students to test
tap water and evaluate the qual-
ity of the water. Highly directive
teacher materials provide script.

041

**TEACHING AQUIFER PROTECTION:
A CURRICULUM SUPPLEMENT**

Publication date not available.

Cost: \$15.00 (includes shipping)
Clemson University CES

Provides activities designed as a
curriculum supplement. Focuses
on water quality protection and
water conservation. Learning
objectives are referenced to state
basic science skills for easy inter-
face with school curriculum.
Written for South Carolina audi-
ence, but more broadly applicabl.

042

THE WATER AROUND US

publication date not available

Cost: \$2.00

University of Vermont
Extension Service

One of 3 packets designed as a
supplement to the classroom. The
others are "Our Groundwater"
and "The Water Around Us".
Provides directions for demon-
strations and activities about the
water cycle and water conserva-
tion.



043

WATER CONSERVATION IN-SCHOOL CURRICULUM

publication date not available

Cost: \$25.00 (includes shipping)

Univ. of Nevada CES
Carson City, NV

Water education activities designed for easy integration into class activities. Binder separates materials by grade. Each unit contains list of activities and materials needed, separated by day. When conducting activities, teacher borrows box of equipment from the Cooperative Extension office. Goals/objectives not stated for each activity specifically, but for the unit overall. Many of same concepts presented at each grade level (especially grades 1 and 2). Grade 4 examines climate effects—not usual part of most water curriculum. Grade 5 curriculum emphasizes soil and erosion. Includes suggestion for activities for science fairs and an environmental education packet from the Garden Club of America. Reading level and concepts may be too advanced for suggested grade levels.

044

WATER EDUCATION

1985

Cost: \$4.75 + 1.50 for shipping

International Office for Water Education
UMC 82
Utah Water Research Laboratory
Logan, UT 84322

Activities for school setting seek to develop water literacy through active learning. Activities stress comprehension of water concepts, development of attitudes about water issues, and skills to solve water issue problems. Concepts/vocabulary may be difficult for K-6 graders (eg, porosity, saturation, volume, density).

045

WET WATER EDUCATION FOR TEACHERS (KANSAS)

1988

Cost: \$50.00 (includes shipping)

State 4-H Office
Umberger Hall
237 Seaton Hall
Manhattan, KS 66506
(913) 532-5800

This curriculum is not a version of the Montana and North Dakota WET materials. Materials cover: the water cycle, the water supply, wastewater treatment/water treatment, water conservation, and water pollution. Contains activities for elementary, junior and senior high students. Doesn't delineate by grades. Appendix includes additional educational materials, Kansas specific information, and a bibliography of resources.

046

WET WATER EDUCATION FOR TEACHERS (MONTANA)

1991

Cost: \$10.00 (includes shipping)

Montana Water Resources Research Institute
122 Gaines Hall
Montana State University
Bozeman, MT 59717
(406) 994-5392

Modified for the Montana region based on original materials developed by North Dakota State Water Commission. Project WET Montana is a companion project of a regional water education program, The Western Watercourse.

Provides activities which aid in understanding the impact of geography on human culture, an uncommon feature of water curricula. Activities seem appropriate for middle to high school age students. Some activities will have to be adapted for middle school students. This curriculum provides

multidisciplinary activity choices related to a variety of water issues and the role of water in people's lives. Currently, Project WET is involved in a complete revamping of curriculum through nationwide efforts.

047

WATER IN YOUR HANDS

1991

Cost: guide, \$1.50; comic book, \$0.75

Soil and Water Conservation Society
7515 NE Ankeny Road
Ankeny, IA 50021-9764
1-800-THE-SOIL

Curriculum consists of a comic book-style story about water with 4 accompanying activities. Relies on "learning cycle strategy: exploration, concept development, and application." Suggests unique educational strategy of using journals for notes, reflections, and sharing them as parts of activities. Includes resource list for both students and teachers.

048

WATER MAGIC/SPLASH! ACTIVITY BOOK

1991 (Water Magic); 1990 (Splash)

Cost: activity book, \$6.50 + \$2.30 shipping; comic \$0.26

American Water Works Assoc.
6666 W. Quincy Ave.
Denver, CO 80235
(303)347-6206

Water Magic can be used separately or as a complement to *Splash! Activity Book*. The 23 activities cover a range of water science, water issues, and water in our culture topics. Activities are varied and age appropriate. Most are appropriate for both the classroom and nonformal settings. Some activities do not relate well to stated objective. Illustrations and activity about groundwater



may lead to a misunderstanding of groundwater and aquifer concepts.

049

WATER QUALITY: A WATER EDUCATION PROGRAM

1990

Cost: 1 sample, free; a kit of 35 copies, \$40.00

Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153

Focuses on water quality as it applies to a public water supply system. Includes text plus two activities.

050

WATER RESOURCE EDUCATION CRITICAL ISSUE: WATER YOU CAN MAKE A DIFFERENCE (K-3)

publication date not available

Cost: \$12.00 + \$1.00 shipping

Cornell Cooperative Extension of Nassau county
1425 Old Country Rd., Bldg. J
Plainview, NY 11803
(516) 454-0900

Binder contains a K - 3 kit and a set of materials for grades 4 - 6. It is not immediately clear which materials are intended for teacher use and which for students. K - 3 activities cover: the significance of water, the water cycle, information about the New York water supply, and hazardous household products. Materials for grades 4 - 6 include: importance of water, the water cycle, water supply, water contamination, and water conservation.

051

WATER RESOURCE EDUCATION WATER RESOURCES: YOUTH EDUCATION CURRICULA (K-6) (7-9)

1992

Cost: \$12.00 + \$1.00 shipping (each)

Cornell Cooperative Extension of Nassau County
1425 Old Country Rd., Bldg. J
Plainview, NY 11803
(516) 454-0900

See notes for K - 3 version. This set contains some materials first developed for WET (North Dakota). The program is designed to correlate with NY state syllabus—elementary science level III Ecosystems. Reading level may be more advanced than suitable for 4-6 graders.

052

WATER RICHES (NEBRASKA)

1993

Cost: instructor's manual with video, \$70.00 (includes shipping)

Cooperative Extension Service
University of Nebraska-Lincoln
Institute of Agriculture and Natural Resources
Lincoln, NE 68583-0771
(402) 472-2824

Indiana and Missouri also have a Water Riches curriculum. Nebraska's is reviewed since the Nebraska materials pioneered this approach. Unique approach includes videos that introduce each of 5 units and an accompanying "newspaper" with more information and activities for the youth. Teacher packet provides guidance for use. Other unusual aspects include suggestions for review activities and activities to teach interviewing skills. Incorporates study skills.

Indiana version:

Cost: instructor's kit with video, \$70.00; gameboard, \$10.00; tabloids, \$1.50/set of five
Media Distribution Center
301 S. 2nd St.
Lafayette, IN 47901-1232
(317) 494-6794

Missouri version:

Cost: teacher's guide, \$3.50 + \$1.00 for each issue; tabloid, \$1.50/set of 5 + \$1.00 shipping

University of Missouri - Columbia
Columbia, MO 65211
(314) 882-2792

054

WATER WATCHERS

1986

Cost: free

Massachusetts Water Resource Authority
Charleston Navy Yard
100 First Ave.
Boston, MA 02129
(617) 242-6000, ext. 4643

Curriculum aimed at improving understanding of personal water conservation needs and of practices which will result in improved water conservation. Uses water science kit and videos to complement written materials. Instructor materials do not include a separate listing of what materials will be needed when or what is included in the science kit. Provides a science and social studies alternative for most lessons. "Water Wizards" is the companion curriculum for grades 3-4.



055

WATER: THE LIQUID OF LIFE

1991

Cost: free

Illinois Environmental
Protection Agency
2200 Churchill Road, Box 19276
Springfield, IL 62794-9276
(217) 782-3397

Water education materials for use in fifth grade classrooms. Materials emphasize text, with some supportive activities. The six modules include: earth as a closed system, the relationship of water to life, the hydrologic cycle, wastewater treatment, water protection, water testing and treatment, and lakes. Poster included.

056

WATER, WATER EVERYWHERE

Publication date not available.

Cost: \$24.95 for all three. (Includes shipping.)

Hach Company
Box 389
Loveland, CO 80539
1-800-227-4224

Includes a teacher's guide to laboratory and field testing of water for a variety of parameters supplemented by a separate student text and teacher resource manual. One of few (if any) curricula that addresses radioactive waste. One of few (if any) curricula that addresses concept of how risk decisions are made in the water quality reference unit booklet. Includes homework activities.

057

WATER WISE

1989

Cost: \$4.00 (includes shipping)

Cornell Cooperative Extension
Department of Natural
Resources
Fernow Hall
Ithaca, New York 14853-3001
(607) 255-2827

Designed for use in the fifth and sixth grade classroom. Activities focus on the water cycle, the aquatic environment, and the causes, effects, and prevention of water pollution. Provides elementary science syllabus chart which correlates water activities with elementary science skills.

058

WATER WIZARDS

1986

Cost: 1 copy free

Massachusetts Water Resources
Authority
Charleston Navy Yard
100 First Ave.
Boston, MA 02129
(617) 242-7110, ext. 4662

Water delivery system and conservation emphasis. Excellent support material, instructions and diagrams for instructor. "Water Watchers" is the companion curriculum for grades 7-8.

059

WATER WORLDS

1988

Cost: \$5.35 (includes shipping)

Media Services
Cornell Business Technical Park
Building 7&8
Ithaca, New York 14850
(607) 255-2080

These materials were designed to be used in a 4-H club setting. The folder provides leader and member guides, activity fact sheets and record keeping sheets. Basic focus is to give youth opportunities to explore and observe aquatic environments. Collection/sampling section includes tips on minimal impact sampling—a nice touch. Water careers is included as a suggestion to invite as guest lecturers people whose careers involve water. Reading material may be too advanced for the young end of the suggested age range.

060

WHAT IS WATER? A STREAM BECOMES AN OCEAN. WHAT IS AN OCEAN? MARINE RESOURCES

Publication date not available.

Cost: One copy free

4-H Marine Education
Box 450

Virginia State University
Petersburg, VA 23803
(804) 524-5848

Materials cover the four topics listed in the title. Designed as school curriculum or school enrichment. Includes leader and member guides.



061

WISE WATER WAYS

1990

Cost: teacher's guide, \$1.50; activity guide, \$1.00 (prices include shipping)

University of Nevada
Cooperative Extension Service
Reno, NV
(702) 731-3130

Three units designed for third through fifth grades. Emphasizes water conservation in a desert environment.

062

**WOW! THE WONDERS OF
WETLANDS**

1991

Cost: free for 1 - 2 copies + \$3.50 shipping

Environmental Concerns, Inc.
P.O. Box P, Education
Department
St. Michaels, MD 21663
(301) 745-9620

This is an educator's guide to providing activities to help kids understand wetlands, the wetland community, and wetland issues. Information is presented in a dense, but lively and attractive format. One of a few curriculum that talks about "natural pollution," and the effect of weather features upon water quality. Excellent use of kinesthetic games to demonstrate water-related dynamics. Unique inset for some lessons called "Nature In Your Neighborhood." Includes suggestions to modify activities for younger and more advanced students. Materials include restoration and action guides. Includes suggestion for community action projects at end.

063

WATER PRECIOUS WATER, BOOK A

1988

Cost: \$12.95 + \$1.30

AIMS Education Foundation
PO Box 8120
Fresno, California 93747
(209) 255-4094

One of several publications from , Activities to Integrate Math and Science (AIMS) in the grades 2 - 6 series. Limited duplication rights are granted with purchase of materials. Math activities often rely on an understanding of multiplication, division and percentages. Some activities are provided in both a low math (visual) and high math (multiplication/division) format. Water activities are related to other curriculum areas through "curriculum coordinates" which provide suggested activities for language arts, social studies, and the arts. Predicting, measuring, calculating, estimating and data collection and analysis skills are emphasized.



STATE/REGIONAL REVIEWED CURRICULA BY STATE AND TITLE

ARIZONA

A Sense of Water (Southern Arizona Water Resources Association)

CALIFORNIA

Captain Hydro and the Further Adventures of Captain Hydro (East Bay Municipal Utility District)

Los Marineros (Channel Islands National Marine Sanctuary)

Water Quality: A Water Education Program (Metropolitan District of Southern California)

Water Precious Water. A Collection of Elementary Water Activities, grades 2 - 6 (Project AIMS).

FLORIDA

Florida 4-H Marine Science Program (University of Florida Cooperative Extension 4-H)

ILLINOIS

Water: The Liquid of Life (Illinois EPA)

INDIANA

Water Riches (Indiana Cooperative Extension Service)

IOWA

G.R.E.A.T. (Groundwater Resource Education Activities for Teachers; Iowa DNR)

KANSAS

Water Education for Teachers (Kansas Cooperative Extension Service)

MAINE

Connections to the Sea (University of Maine Cooperative Extension 4-H)

MARYLAND

Decision Making: The Chesapeake Bay (University of Maryland, Sea Grant; includes issues for all states directly affected by the Bay)

Living in Water: An Aquatic Science Curriculum (also listed on national list)

MASSACHUSETTS

Water Watchers (Massachusetts Water Resource Authority)

Water Wizards (Massachusetts Water Resource Authority)

MICHIGAN

Groundwater Education Program (East MI Environmental Action Council)

Gee-Wow (Ecology Center of Ann Arbor)

MISSOURI

Groundwater Protection Curriculum Guide (Missouri Department of Natural Resources)

Water Riches (Univ. of MO-Columbia Extension Service; Nebraska version reviewed)

MONTANA

Water Education for Teachers (WET; different content from Kansas version)

NEBRASKA

Stop Look & Learn About Our Natural World (Nebraska Natural Resources Commission)

Water Riches (Nebraska Cooperative Extension Service; Indiana version reviewed)

NEVADA

Water Conservation In-School Curriculum (University of Nevada Cooperative Extension)

Wise Water Ways (University of Nevada Cooperative Extension Service)

NEW JERSEY

My World, My Water and Me (New Jersey Department of Environmental Protection and Energy)

NEW YORK

4-H Sport-Fishing Aquatic Resources Education Program (Cornell Cooperative Extension Service)

Water Resource Education (Cornell Cooperative Extension of Nassau County)

Water Wise: Lessons in Water Resources (Cornell Cooperative Extension Service)

Water Worlds (Cornell Cooperative Extension Service)

NORTH DAKOTA

Water Education for Teachers (North Dakota State Water Commission; different content than the Kansas Cooperative Extension WET; Montana version reviewed)

North Dakota State Extension Service Water Activities (North Dakota State University Cooperative Extension Service)

OHIO

Always a River (US EPA)

The Great Lakes in My World (Lake Michigan Federation and University of Ohio Sea Grant)



OREGON

The Stream Scene: Watersheds, Wildlife and People

PENNSYLVANIA

Instructor's Guide To Water Education Activities (Pennsylvania Department of Environmental Resources)

SOUTH CAROLINA

Teaching Aquifer Protection (Clemson University Cooperative Extension Service)

TENNESSEE

Groundwater: A Vital Resource (Tennessee Valley Authority)

UTAH

Water Education

VERMONT

Environmental Education For Youth: Groundwater, Surface Water, Water Around Us (University of Vermont Cooperative Extension Service)

VIRGINIA

Be Water Wise (Virginia Water Resources Research Center, also listed in national materials section)

Sensing the Sea (Virginia Institute of Marine Science)

Virginia CES/4-H Marine Project: What is Water? A Stream Becomes An Ocean. What is An Ocean? Marine Resources (Virginia Cooperative Extension Service)

WASHINGTON

Discover Wetlands (Washington State Department of Ecology)

WISCONSIN

Caring For Our Lakes (University of Wisconsin Institute of Environmental Studies)

Groundwater: Wisconsin's Buried Treasure (Wisconsin Department of Natural Resources)

Local Watershed Problem Studies (University of Wisconsin Water Resources Center)

Our Great Lakes Connection (University of Wisconsin Cooperative Extension Service)

REVIEWED CURRICULA FROM NATIONAL ORGANIZATIONS OR WITH NATIONAL APPLICATION BY TITLE

A Hidden Treasure
(National FFA Foundation)

Aquatic Wild
(Project Wild, Boulder, CO)

Be Water Wise
(Virginia Water Resources Research Center)

Kids Network - What's in Our Water
(National Geographic Society)

Investigating Streams and Rivers
(Project GREEN, Ann Arbor, MI)

Living in Water
(the Baltimore National Aquarium; also listed on state list)

Naturescope: Diving Into Oceans
(National Wildlife Federation)

Project Water Works
(American Water Works Association)

Ranger Rick's NatureScope - Wading Into Wetlands (National Wildlife Federation)

The Story of Drinking Water
(American Water Works Association)

The Tapwater Tour
(LaMotte Company)

Wally the Water Molecule
("Chem Kids", Moreno, CA)

Water in Your Hands
(Soil and Water Conservation Society)

Water Magic
(American Water Works Association)

Water Quality Curriculum: Surface Water Unit, The Groundwater Adventure, Waste Water
(Water Environment Federation, formerly Water Pollution Control Federation)

Water, Water Everywhere
(Hach Company)

WOW, The Wonders of Wetlands
(Environmental Concern Incorporated)



UNIQUE SUPPORT MATERIALS FOR YOUTH WATER EDUCATION

The following materials could not be considered as youth water education curriculum, but do provide an important resource for those developing youth water education programs.

Items are included in this list if they:

- provide a unique strategy for educating youth about water.
- provide a unique water education resource not easily repeated locally.
- are cited frequently in water education bibliographies.

Computer based educational programs were not investigated in this study. A few are mentioned here, but should not be considered as the only materials of this type available. Published water education bibliographies are listed at the end of this section.

UNIQUE PROGRAM STRATEGIES

Angler Education leader training and programs (sponsored by US Fish and Wildlife)

CONTACT: your state conservation agency

Aquatic education materials being developed/adapted for the hearing-impaired

Federal Aid Division
U.S. Fish and Wildlife Service
911 N.E. 11th Avenue
Portland, Oregon 97232-4181
503/231-6128

Field Manual for Water Quality Monitoring: An Environmental Education Program for Schools (University of Michigan, School of Natural Resources)

Thomson-Shore Printers
7300 Joy Rd.
Dexter, Michigan 48130

GEM. The Groundwater Education In Michigan Program. Provides summaries of projects developed through annual grant funds and sources of products which were created.

The Institute of Water Research
Michigan State University
334 Natural Resources Bldg.
East Lansing, Michigan 48824
517/353-3742

National Directory of Citizen Volunteer Environmental Monitoring Programs

(US EPA and Rhode Island Sea Grant College Program.
Publication no. EPA 503/9-90-004)

CONTACT: Your EPA Regional Office

Public Involvement and Education Model Projects Fund. 47 Success Stories from Puget Sound. (Puget Sound Water Quality Authority)

Puget Sound Water Quality Authority
Mail Stop PV-15
Olympia, Washington 98504
206/493-9300

Save Our Streams. A Citizen Action Program (Izaak Walton League of America)

**Save Our Streams Kit
Wetlands Watch Kit**

Izaak Walton League of America
1401 Wilson Blvd., Level B
Arlington, Virginia 22209
703/528-1818

Tennessee Valley Authority Teacher/Student Water Quality Monitoring Network (Tennessee Valley Authority, Chattanooga, Tennessee)

Water Quality Branch
Tennessee Valley Authority
270 Haney Bldg.
Chattanooga, Tennessee 37402-2801

The Western Watercourse. A Regional Adult and Youth Water Education Program (Montana State University, Bozeman, Montana; national WET, Water Education for Teachers, program development in process)

Project WET Programs
Culbertson Hall
Montana State University
Bozeman, Montana 59717
406/994-5392

USGS Water Resources Education Initiative Program notebooks for water resource specialists visiting classrooms (USGS with Bureau of Land Management, US Fish and Wildlife, US EPA, the National Science Teachers Association, and the American Water Resources Association)

Chief, Earth Science Education Project
U.S. Geological Survey
Denver Federal Center
PO Box 25046 MS 414
Denver, Colorado 80225



UNIQUE SUPPORT MATERIALS:

Water education activities

Acid Rain Curriculum,
grades 4 - 8

Acid Rain Curriculum,
grades 6 - 12

Acid Rain Foundation, Inc.
1410 Varsity Dr.
Raleigh, North Carolina 27606
919/828-9443

**AIMS, Activities Integrating
Mathematics and Science.**
**Grades K-4 Series. Grades K-6
Series. Grades 5-9 Series (AIMS
Education Foundation)**

AIMS Education Foundation
PO Box 8120
Fresno, California 93747
209/255-4094

**Ask the Aquarium Fact Sheet
Packet (National Aquarium,
Baltimore, Maryland)**

National Aquarium in
Baltimore
Pier Three
501 East Pratt Street
Baltimore, Maryland 21202

**BARK, Backyard Acid Rain Kit
(Public Focus)**

Public Focus
489 College St. Suite 500
Toronto, Ontario M6G1A5
416/967-5211

**The Changing Chesapeake, an
introduction to the natural histo-
ry and history of the Chesapeake
Bay for upper elementary and
middle school children (National
Aquarium in Baltimore and U.S.
Fish and Wildlife Service)**

National Aquarium in
Baltimore
Pier Three
501 East Pratt Street
Baltimore, Maryland 21202

Carreras en las Ciencias Marinas.
**UPR SG 04-F-158-44030 A/E-71
1984. #16 (University of Puerto
Rico, Sea Grant)**

Programa Sea Grant
Departamento de Ciencias
Marinas
Recinto Universitario de
Mayaguez
Mayaguez, P.R. 00708
809/832-4040

**Fisheries Education Units #16, 18
(Maine Department of Marine
Resources)**

*"Estuarine Studies. An Activities
Text for Maine Schools"*
"Field Trip in the Classroom"
*"Field Testing Manual for
Water Quality"*

Maine Department of
Marine Resources
The Education Division
State House Station #21
Augusta, Maine 04333-0021

**Fishing for Fun and Learning
(University of Wisconsin
Cooperative Extension Service)**

University of Wisconsin-
Extension
Extension Publications
Rm. 245, 30 N. Murray St.
Madison, WI 53715
608/262-3346

**Fishing . . . Get in the Habitat
(Minnesota Department of
Natural Resources and
University of Minnesota
Cooperative Extension, 4-H
Youth Development)**

MinnAqua
Minnesota DNR
Section of Fisheries
500 Lafayette Road, Box 12
St. Paul, Minnesota 55155
612/296-3325

Friends: Special Water Edition.
**A Magazine for Young Readers
From Georgia 4-H Clubs.**
**(University of Georgia
Cooperative Extension Service)**

University of Georgia
Cooperative Extension Service
College of Agriculture
Athens, Georgia

**Investigating Your Environment
Series (Forest Service, United
States Department of
Agriculture, new water educa-
tion materials in development)**

Forest Service office in your
state, or
USDA Forest Service-CF
PO Box 96090
Washington, D.C. 20090-6090

**Jefferson County 4-H Water
Quality Project
(Washington State University,
Jefferson County Cooperative
Extension)**

Christopher F. Feise
Washington State University
7612 Pioneer Way E.
Puyallup, Washington 98371-
4998
206/840-4556

**KARE, Keystone Aquatic
Resource Education. "Water
Resources in Pennsylvania. An
Earth Science/Biology Unit"**
(Pennsylvania Fish Commission)

Pennsylvania Fish Commission
Bureau of Education and
Information
PO Box 1673
Harrisburg, PA 17105-1673
717/657-4519



Lake Game for Youth. Lake Superior Game: Use vs. Abuse. Lacustrine Lessons newsletter (discontinued in 1988)(Minnesota Sea Grant)

your state's Sea Grant Program,
or
Minnesota Sea Grant Program
Minnesota University
Minneapolis, Minnesota 55414
612/625-9790

Lines on the Land. A "hands-on" soil and water conservation learning package for 6th-8th grades (National Association of Conservation Districts)

National Association of
Conservation Districts
PO Box 855
League City, Texas 77574
1-800/825-5547

My Wetland Coloring Book (US EPA)

US Environmental
Protection Agency
Region 6
1201 Elm Street
Dallas, Texas 75270

OBIS, Outdoor Biology Instructional Strategies packets: Aquatic Animal Behavior; Breakwaters and Bays; Desert; Ponds and Lakes; Seashore; Streams and Rivers (Delta Education, Inc.)

Delta Education
PO Box 915
Hudson, NH 03051-0915
1-800/258-1302 or
603/889-8899

OEAGLS, Oceanic Education Activities for Great Lakes Schools. 27 interdisciplinary investigations for grades 5-9, 4 activities for primary grades, computer based program, careers booklet. Activities can be ordered separately or in a package. (Ohio Sea Grant and The Ohio State University)

Ohio Sea Grant
Education Office
283 Arps Hall
1945 N. High Street
Columbus, Ohio 43210

Project Earthcare. Soil and Water Stewardship Activities (St. Louis County, Missouri Soil and Water Conservation District)

Soil and Water
Conservation District
St. Louis County, Missouri

Ranger Rick's NatureScope Pollution: Problems and Solutions (National Wildlife Federation)

National Wildlife Federation
1400 Sixteenth Street, N.W.
Washington, D.C. 20036-2266

Responsible Angling. The Oregon Angler Education Manual (Oregon Department of Fish and Wildlife, Oregon State University Extension Service)

Outdoor Empire Publishing,
Inc.
PO Box 19000
511 Eastlake Avenue, East
Seattle, Washington 98109
206/624-3845

Stream Sampler Tour. MacIntosh based computer software (Thames Science Center, Connecticut)

Thames Science Center,
Connecticut
Gallows Lane
New London, Connecticut
06320
203/442-0391

The Tardy Twins Meet Polluto, comic and teacher's guide. (East Bay Municipal Utility District, Oakland, CA)

Innovative Communications
207 Coggins Drive
Pleasant Hill, California 94523

Terrene Institute nonpoint source model and curriculum for fifth and sixth grade (Terrene Institute in cooperation with US EPA, Washington, D.C.)

Terrene Institute
1000 Connecticut Ave. N.W.,
Suite 802
Washington, D.C. 20036
202/833-8317

Toward A Sustainable Agriculture: A Curriculum (University of Wisconsin Center for Integrated Agricultural Systems)

Center for Integrated
Agricultural Systems
University of
Wisconsin-Madison
240 Agriculture Hall
1450 Linden Dr.
Madison, Wisconsin 53706

University of Minnesota 4-H Youth Development, youth fact sheet series "Wetland Restoration" "Water Stewardship" "Well-Water Testing" "Household Hazardous Wastes"

University of Minnesota
4-H Youth Development
340 Coffey Hall
1420 Eckles Avenue
St. Paul, Minnesota 55108
612/625-1731



Water Can Be Fun. How to Create A Successful Science Fair (American Water Works Association)

American Water Works Association
6666 W. Quincy Ave.
Denver, Colorado 80235
303/794-7711

Watercard: A Hypercard Stack and Manual for Calculating Water Quality (University of Wisconsin Cooperative Extension Service)

University of Wisconsin Cooperative Extension
Environmental Resources Center
216 Agriculture Hall
1450 Linden Dr.
Madison, Wisconsin 53706
608/262-0020

Water Ecology Topics. K-8 Group Outdoor Activities for Stream, Pond and Schoolyard (Youth Science Institute, CA)

Youth Science Institute
296 Garden Hill Dr.
Los Gatos, California
408/356-4945

Water Fun For You (American Water Works Association)

American Water Works Association
6666 W. Quincy Ave.
Denver, Colorado 80235
303/794-7711

Water Play, activities and teachers guide (East Bay Municipal Utility District, Oakland, CA)

Innovative Communications
207 Coggins Drive
Pleasant Hill, California 94523

Water Quality and Aquatic Resources Protection Activities. A packet of 20 4-H activities, community service and fair projects. (Washington State University, Thurston County Cooperative Extension)

Christopher F. Feise
Washington State University
7612 Pioneer Way E.
Puyallup, Washington
98371-4998
206/840-4556

Water, Water, Everywhere. Seventy activities for elementary through secondary level can be ordered separately or in packets by age. (Oregon State University Extension Service)

OSU Extension Sea Grant
Hatfield Marine Science Center
Newport, OR 97365
503/867-0271

Wavelets, Marine Schoolhouse Series No. 1 - 27 (Virginia Institute of Marine Science, Sea Grant Marine Advisory Services)

VIMS/Sea Grant
Publications Office
Gloucester Point, Virginia
23062
804/642-2111

"Wetlands and Wildlife" curriculum materials

(Alaska Department of Fish and Game and U.S. Fish and Wildlife Service)

U.S. Fish and Wildlife Service
1011 E. Tudor Ave.
Anchorage, Alaska 99515
907/786-3351

Wild Louisiana. Aquatic Activities for Environmental Science (Louisiana Sea Grant)

Louisiana State University
Louisiana Sea Grant
College Program,
Communications Office
Baton Rouge, Louisiana 70803-7507
504/388-6448

Educational program idea sources

Many state University Cooperative Extension Services and state Conservation Departments provide water education materials and resources specific to that state. Some of these materials are youth education pieces and have been listed elsewhere in this study when possible. Other materials were designed as resources for the general adult audience or professionals and interest groups serving the general public.

No effort was made to list all of those materials here. Materials listed in this section are high quality examples of available materials. See the list of water education bibliographies included in this publication or contact your state's agencies for more information.

Angler Ethics Program (National Wildlife Federation, in process)

National Wildlife Federation
Education and Research,
Outdoor Ethics Division
8925 Leesburg Pike
Vienna, VA 22184-0001
703/790-4267



**Citizens Guide to Clean Water
(Izaak Walton League)**

Izaak Walton League of
America
1401 Wilson Blvd., Level B
Arlington, Virginia 22209

**Classrooms Without Walls. A
Guide for Developing Aquatic
Education Trails**

Alaska Department of
Fish and Game
Division of Sport Fish, Aquatic
Education
PO Box 240020
Douglas, Alaska 99824
907/965-4180

**Clean Water Resource Packet for
Youth and Youth Educators
(University of Minnesota
Extension Service)
(A compilation of materials to be
photo copied at cost)**

University of Minnesota
4-H Youth Development
340 Coffey Hall
1420 Eckles Avenue
St. Paul, Minnesota 55108
612/625-1731

**The Conservation Handbook
(Boy Scouts of America)**

CONTACT: your local Boy
Scout office

**Drinking Water Week
annual packet
(USDA Cooperative Extension
Service, Washington, DC)**

CONTACT: your County
Extension office

**Drinking Water: A Community
Action Guide (Concern, Inc.)**

Concern, Inc.
1794 Columbia Road, N.W.
Washington, D.C. 20009
202/328-8160

**Drinking Water Education
Programs, A Guide for County
Faculty (University of Wisconsin
Cooperative Extension Service)**

Central Wisconsin
Groundwater Center
University of Wisconsin,
Cooperative Extension
UW-Stevens Point College of
Natural Resources
Stevens Point, WI
715/346-4270

**Environmental Software
Programs
(EPA Water Education)**

*Agricultural Pollution Prevention
Groundwater Education System '91*
*Principles and Design of Onsite
Waste Disposal with Septic
Systems '91*
*Private Water Systems Education
System '91*
*Residential Water Conservation
Techniques '91*

U.S. Environmental
Protection Agency
ATTN: Alfred E. Krause
77 W. Jackson, WC-15J
Chicago, Illinois 60604
FAX: 312/886-0168

**The Freshwater Foundation,
education materials (Freshwater
Foundation, Navarre, Minnesota)**

Freshwater Foundation
Spring Hill Center
725 County Rd. 6
Wayzata, Minnesota 55391
612/449-0092

**Getting to Know Your Stream:
Stream Habitat;
Getting to Know Your Stream:
Water Quality and Stream
Biology
(University of Wisconsin
Cooperative Extension of
Dane County)**

Dane County WaterWatchers
Dane County Extension
57 Fairgrounds Drive
Madison, Wisconsin 53713-1497
608/266-4271

**Groundwater:
A Community Action Guide
(Concern, Inc.)**

Concern, Inc.
1794 Columbia Road, N.W.
Washington, D.C. 20009
202/328-8160

**Handle With Care. Your guide to
preventing water pollution
(Terrene Institute)**

Terrene Institute
1000 Connecticut Ave. N.W.,
Suite 802
Washington, D.C. 20036
202/833-8317

**Investigating the Marine
Environment: A Sourcebook.
Volumes 1-3
(Project Oceanology)**

Project Oceanology
Avery Point
Groton, Connecticut

**Marine Science Methods for the
Classroom, fact sheets #1-9
(Virginia Institute of Marine
Science Sea Grant Marine
Advisory Services)**

VIMS/Sea Grant
Publications Office
Gloucester Point, Virginia
23062
804/642-2111

**Manual for Use of the Sand-Tank
Groundwater Flow Model
(University of Wisconsin
Cooperative Extension)**

Central Wisconsin
Groundwater Center
College of Natural Resources
University of
Wisconsin-Stevens Point
Stevens Point, WI
715/346-4270



Nontraditional Marine Education Activities: a planning guide (Virginia Sea Grant College Program, Educational Series Number 32)

VIMS/Sea Grant
Publications Office
Gloucester Point, Virginia
23062
804/642-2111

Project Mayfly. Guide to the Determination of Water Pollution in Local Waterways (National Audubon Society)

National Audubon Society
Mid-Atlantic Regional Office
1104 Fernwood Ave., #300
Camp Hill, Pennsylvania 17011
717/763-4985

Puget Soundbook (Puget Sound Water Quality Authority; also see Maryland's and Green Bay, Wisconsin's "Baybooks" available from their state conservation agencies)

Marine Science Center
18743 Front St. NE
PO Box 2079
Poulsbo, Washington 98370

Reaching Tomorrow's Consumers Today. Youth Education Programs for Utility Managers (American Water Works Association)

American Water Works
Association
6666 W. Quincy Ave.
Denver, Colorado 80235
303/794-7711

Salt Marsh Manual, an educator's guide (San Francisco Bay National Wildlife Refuge)

San Francisco Bay National
Wildlife Refuge
PO Box 524
Newark, California 94560
415/792-0222

Sandcastle Moats and Petunia Bed Holes. A book about groundwater. (Virginia Water Resources Research Center)

Virginia Water Resources
Research Center
Virginia Polytechnic Institute
and State University
617 North Main Street
Blacksburg, Virginia 24060-3397
703/961-5624

Washington Post, "The Mini Page," October 28, 1990. Treat Water Well

CONTACT: your local library

Water Quality Field Guide (USDA Soil Conservation Service)

CONTACT: your state office of
the Soil Conservation Service,
or
United States Department of
Agriculture
Soil Conservation Service
PO Box 2890
Washington, D.C. 20013

Water Quality Indicators Guide: Surface Waters (USDA Soil Conservation Service)

CONTACT: your state office of
the Soil Conservation Service,
or
United States Department of
Agriculture
Soil Conservation Service
PO Box 2890
Washington, D.C. 20013

**Water Quality Series
Booklet 1: Water Quality
Sampling Equipment
Water Quality Series
Booklet 2: Homemade Sampling
Equipment (Tennessee Valley
Authority; to accompany TVA's
Teacher/Student Water Quality
Monitoring Network)**

Water Quality Branch
Tennessee Valley Authority
270 Haney Bldg.
Chattanooga, Tennessee 37402-
2801

**Water, Water, Everywhere . . . A
Guide to Marine Education in
Oregon (Oregon State University
Extension Service)**

OSU Extension Sea Grant
Hatfield Marine Science Center
Newport, OR 97365
503/867-0271

**Wetlands and Water Quality: A
Citizen's Handbook for
Protecting Wetlands (Lake
Michigan Federation)**

Lake Michigan Federation
59 East Van Buren, Suite 2215
Chicago, Illinois 60605
312/939-0838



SELECTED BIBLIOGRAPHIES FOR FURTHER INFORMATION

Catalog of Water Quality Educational Materials (Tennessee Valley Authority)

TVA Water Quality Branch
270 Haney Bldg.
Chattanooga, Tennessee 37402-2801

Educational Videos for Children About Our Precious Water Resources! (US EPA, #430/09-91- 016(B))

EPA's Video Lending Library
1-800/624-8301

Environmental Education Compendium for Water Resources (California Department of Education, California Department of Water Resources, Sonoma State University)

California Department of Water Resources
ATTN: Public Information and Education Branch
1416 9th St., Rm. 1104-1
Sacramento, California 95814
916/653-6192

Environmental Education Materials For Teachers and Young People (Grades K - 12) (#OPA 87-022, US EPA)

Office of Community and Intergovernmental
Relations (A-108 EA)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
202/382-4454

Florida Marine Education Resources Bibliography (SGR-51, Florida Sea Grant College)

Pine Jog Environmental Sciences Center
College of Science
Florida Atlantic University
West Palm Beach, Florida 33406

The Freshwater Foundation (Freshwater Foundation, Navarre, Minnesota)

The Freshwater Foundation
2500 Shadywood Rd.
Box 90
Navarre, Minnesota 55392
612/449-0092

Directory of Great Lakes Education Material (International Joint Commission United States and Canada)

International Joint Commission
Great Lakes Regional Office
100 Ouellette Avenue, Eighth Floor
Windsor, Ontario N9A 6T3
or:
PO Box 32869
Detroit, Michigan 48232-2869

Ground Water Education in America's Schools. A Catalog of Resource Materials for Elementary and Secondary Education Professionals (The American Ground Water Trust)

The American Ground Water Trust
6375 Riverside Drive
Dublin, Ohio 43017
614/761-2215

1990 Nebraska Environmental Education and Information Resources Directory

Nebraska Natural Resources Commission
PO Box 94876
Lincoln, Nebraska 68509-4876
402/471-2081

Save Our Streams Resource List (Izaak Walton League)

The Izaak Walton League of America, Inc.
1401 Wilson Boulevard, level B
Arlington, Virginia 22209
703/528-1818

Streams, Lakes and Wetlands. A Collection of Curriculum and Reference Materials (City of Everett Department of Public Works)

City of Everett Department of Public Works
Storm and Surface Water Management
Community Involvement Program
Everett, Washington
206/259-8863



**Water Education 101
(American Water Works Association)**

Youth Education Manager
American Water Works Association
6666 W. Quincy Ave.
Denver, Colorado 80235
303/794-7711

**Water Education Foundation resources listing
(Water Education Foundation)**

Water Education Foundation
717 K Street, Suite 517
Sacramento, California 95814
916/444-6240

**The Water Quality Catalog. A Source Book of
Public Information Materials (Water Environment
Federation)**

Water Environment Federation
601 Wythe Street
Alexandria, Virginia 22314
703/684-2400

**Water Quality Education Bibliography (Cooperative
Extension Washington State University)**

Christopher F. Feise
Washington State University
7612 Pioneer Way E.
Puyallup, Washington 98371-4998
206/840-4556

**Youth Water Quality Resources
(USDA, Cooperative Extension Service)**

Cooperative Extension Service,
4-H and Youth Development
United States Department of Agriculture
3861 South Building
Washington, D.C. 20250
202/447-5516

YOUTH WATER CURRICULUM SUMMARY

T O P I C S

Youth water curriculum	Main emphasis of curriculum	Science of water	Water-related ecosystems	Drinking water supply: quantity & quality	Water use	Water pollution/Contamination sources	Water quality: risk assessment & reduction	Management & protection strategies for specific uses	Government & citizenship
Adventures of Wally, the Water Molecule (001)	water chemistry	specific							
Always a River (002)	river ecology, human and cultural impacts	many	several Ohio River	some	some	several	some	some	several
Aquatic Wild (003)	wildlife conservation in aquatic environment	several	several ponds, streams wetlands watersheds	specific	several	several	specific		some
Be Water Wise (004)	personal water use	some	specific	some	some	several	specific	specific	several
Captain Hydro (053)	use, conservation, management	some		some	some			specific	some
Caring for Our Lakes (005)	Yahara River, watershed ecology, human impact	some	some lakes watershed		specific	specific	some	some	some
Children's Festival Outreach Packet (006)	groundwater basics	several		some	specific			specific	several
Connections to the Sea (064)	ocean environment	some	some			some			
Decision Making/The Chesapeake Bay (007)	simulate public policy decision process	some	some Chesapeake Bay	some	several	several	some	several	several
Discover Wetlands (008)	water science, wetland ecology	specific	some			specific	some	some	some
Florida 4-H Marine Science Program (065)	ocean ecology		some						
Gee-Wow (009)	groundwater science, management	some	specific	specific	some	several	specific	some	several
The Great Lakes in my World (010)	ecology, human impact	several	some Great Lakes		some	specific	several	specific	some
Groundwater Adventure (011)	science, human impact, management	some	specific	specific	some	some	some	some	several
Groundwater: A Vital Resource (012)	science, human impact	specific	some ponds streams	specific	some	several	several	specific	specific
Groundwater Education Program (013)	science, protection	specific	specific	specific		some	specific	specific	some
Groundwater Protection Curriculum Guide (014)	science, protection	some		several	several	several	specific	some	several

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ENVIRONMENTAL EDUCATION GOALS

FORMAT

Water-related careers	Ecological foundations	Conceptual awareness: issues & values	Investigation skills	Evaluation skills	Environmental action skills	Grade levels	Instructor materials	Student materials	Instructional environment	Subject areas addressed
	specific		some			K-3	manual video		indoor	Sci M LA Art
several	several	several	several	several	several	K-12	manual		indoor field	Sci SS LA Art
	several	several	several	several	several	K-12	manual		indoor field	Sci SS M LA Art
	several	several	several	specific	specific	7-8	manual	activity guide	indoor field	Sci SS M LA
some		some	some	several	some	6-9	2 manuals	manual comic book	indoor field	Sci SS M LA Art
	several	several	several	several	some	6-8	manual		indoor field	Sci SS M LA Art
	specific		some		some	NS	activities	game materials	indoor	Sci M SS LA Art
	some	specific	some			NS	manual		field	Sci SS M LA Art
	several	several	several	several	several	9-12	manual		indoor	Sci SS LA
	several	several	several	several	some	4-8	manual		indoor field	Sci SS M LA Art
	several	some	some			NS	2 manuals	project guide and member book	indoor field	Sci
	some	some	several	some	some	K-6	manual	video	indoor field	Sci SS Art
	several	several	several	several	some	K-8	manual		indoor	Sci SS M LA Art
	specific	some	some	some	some	NS	manual	activity guide video	indoor	Sci
	some	specific	some	some	specific	9-12	manual		indoor field	Sci M LA
	some	several	several	some	several	6-12	resource packet		indoor field	Sci SS LA Art
	some	several	some	several	several	4-12	manual		indoor field	Sci SS

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YOUTH WATER CURRICULUM SUMMARY

T O P I C S

Youth water curriculum	Main emphasis of curriculum	Science of water	Water-related ecosystems	Drinking water supply: quantity & quality	Water use	Water pollution/Contamination sources	Water quality: risk assessment & reduction	Management & protection strategies for specific uses	Government & citizenship
GREAT—Groundwater Resources and Education Activities (015)	science, human impacts	some	specific Iowa Mississippi River	specific	several	several	some	some	several
Groundwater Study Guide (016)	science, treatment, conservation	some		some	several	specific		some	several
A Hidden Treasure (017)	science, protection, for agricultural education	some	some	some		some	some	some	some
Instructor's Guide to Water Education Activities (018)	water science, use, conservation	some	specific watersheds	specific	some				
Investigating Streams and Rivers + Field Guide (019)	stream monitoring, ecology		some streams rivers		specific		some		
Kids Network (066)	watersheds	some	specific watersheds	some	specific	some	some		
Living in Water: An Aquatic Science Curriculum (020)	marine science, ecology	some	several			several	some	specific	
Local Watershed Problem Studies (elementary) (021)	water science, ecology, attitudes	some	some ponds streams watersheds	some	several	some	some	specific	several
Local Watershed Problem Studies (middle & high school) (022)	human impact on water quality	specific	lakes, streams wetlands watersheds		several	some	some	some	several
Los Marineros (023)	marine science, ecology, human impacts	specific	some Santa Barbara Channel		specific	specific			some
My World, My Water and Me (067)	human impact on water	specific	specific		some	some	specific	specific	
Nature Scope: Diving into Oceans (024)	marine science, ecology, human impacts	specific	same marine		some	specific		specific	specific
Nature Scope: Wading into Wetlands (025)	fresh, saltwater, wetland ecology, human impacts		some wetlands						specific
N. Dakota State Univ. Extension Service — Water Activities (026)	brief, overall water curriculum	several	specific	specific	several	specific	specific	specific	
Our Great Lakes Connection (027)	appreciating the Great Lakes	some	specific Great Lakes		specific		specific		
Our Groundwater (028)	groundwater science concepts	some		some		several	specific	some	

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FORMAT

Water-related careers	Ecological foundations	Conceptual awareness: issues & values	Investigation skills	Evaluation skills	Environmental action skills	Grade levels	Instructor materials	Student materials	Instructional environment	Subject areas addressed
	some	several	several	several	several	7-8	binder, ground-water model, posters		indoor field	Sci SS M LA
	specific	some	several	several	several	6-9	resource packet		indoor field	Sci SS M LA Art
	some	some	some	some	some	9-12	manual	field	indoor	Sci
	specific	specific	specific			K-9	manual		indoor field	Sci SS M LA Art
	specific	some	several	specific	several	6-12	manual	computer conference network	indoor field	Sci SS M LA
	some	some	several	several	some	4-6	manuals, software, activity packet	handbook	indoor field	Sci SS M LA
	some	specific	several			4-6	manual		indoor field	Sci M LA
	some	several	some	several	several	K-6	manual		indoor field	Sci SS M LA Art
	several	several	several	several	several	6-12	manual		indoor field	Sci SS M LA Art
several	some	specific	some	specific	some	5-6	binder		indoor field	Sci SS M Art
	specific	specific	some	some		2-6	booklet		indoor	Sci SS M LA Art
	some	some	several	some	specific	K-8	magazine format	copy cat pages	indoor field	Sci SS M LA Art
	some	some	several	several	specific	K-8	magazine format	copy cat pages	indoor field	Sci SS LA Art
	some	some	some	specific	some	NS	fact sheet format	fact sheet format	indoor field	Sci SS M LA Art
	some	some	several	some	some	K-8	manual		indoor field	Sci SS M LA Art
	some	some	some	some	some	NS	information packet		indoor field	Sci SS M LA Art

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T O P I C S

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Our Surface Water (029)	field studies		some ponds, streams watersheds			some	specific		
Project Water Works (030)	science, management	some	specific	specific	specific	specific			several
A Sense of Water (031)	science use, impact on humans	some	specific	specific	several	specific	specific	specific	several
Sensing the Sea (032)	marine science, ecology		specific						
SAREP—4H Sportfishing Aquatic Resources (033)	aquatic ecology, water recreation	specific	several		some		some	specific	specific
Stop, Look & Learn About Our Natural World I (034)	water science, conservation	some		specific		specific	specific		
Stop, Look & Learn About Our Natural World II (035)	water science, conservation	some ponds	some	specific	some	some			
Stop, Look & Learn About Our Natural World III (036)	water science, conservation	some		specific	several		some	some	
The Story of Drinking Water (037)	overall water curriculum	some		some			specific		specific
The Stream Scene (038)	watershed & stream-bank ecology	several	several streams		specific	some	some	some	specific
Surface Water (039)	water science, human impact and mgmt.	some	several	specific		several	specific	specific	several
The Tapwater Tour (040)	water testing, analysis			several					
Teaching Aquifer Protection (041)	water quality protection	several		some	some	several		specific	specific
The Water Around Us (042)	hydrologic cycle, conservation	some	some						
Water Conservation In-School Curriculum (043)	water science, conservation	some	some	some	specific	some	specific	some	
Water Education (044)	water science, use	several	some	some	several	specific	specific	specific	some
WET—Water Education for Teachers (KS) (045)	overall water curriculum	several		some	several	some	some	some	some
WET—Water Education for Teachers (MT) (046)	human culture, water use, science, conserv.	some	specific	specific	some			specific	some
Water in Your Hands (047)	how humans use, impact on water	some		some	some	several			some
Water Magic (048)	overall water curriculum	some		some	some	specific	specific		

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	some	some	several			NS	information packet		indoor field	Sci
	specific	several	several	several	several	NS	binder, computer software	computer software	indoor field	Sci SS M
	several	several	several	several	some	K-6	manual		indoor field	Sci SS M LA Art
	some		some	specific		K-3	manual		indoor	Sci LA Art
	some	some	several	some	specific	NS	binder 39 leader guides		indoor field	Sci SS M LA
	specific	specific	some			K-2	manual		indoor field	Sci SS M LA Art
	some	some	several	several	some	3-4	manual		indoor	Sci M LA Art
	some	some	some	some	specific	5-6	manual		indoor field	Sci SS M LA Art
	specific	some	specific	some	some	7-12	manual	comic book	indoor field	Sci SS M Art
some						6-12	binder		indoor field	Sci M
	specific	some	some	specific	specific	7-9	manual	booklet video	indoor field	Sci SS
			several			NS	binder		indoor	Sci M
	some	some	several	some	some	4-6	binder		indoor field	Sci M
	some	some	some	specific	some	NS	information packet		indoor	Sci M Art
	some	some	several	specific	some	1-5	binder, grades separated		indoor field	Sci SS M LA Art
	several	several	some	some	specific	K-6	manual		indoor field	Sci SS M LA Art
	some	some	several	several	several	K-12	binder, topics separated		indoor field	Sci SS M LA
	specific	some	some			NS	manual		indoor field	Sci SS M LA Art
	specific	several	some	several	some	NS	teacher guide	comic		
some	specific	specific	some			K-3	manual	comic	indoor	LA Art

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Water Precious Water (053)	science and math skills	several	some	specific			specific		specific
Water Quality: A Water Education Program (049)	science, measurements	specific		some		specific	some		specific
Water Resource Education (k-3) (050)	water science, use	several		specific				specific	
Water Resource Education (4-6) (051)	water science, use	several	specific	several	specific		some	specific	specific
Water Riches (Nebraska) (052)	overall water curriculum	several	specific Ogalla Aquifer	some	some	some		specific	
Water Watchers (054)	water supply, conservation	some		specific	some	specific			specific
Water, the Liquid of Life (055)	water science, ecology, use	some low	specific lakes	several	some	several	some	specific	several
Water, Water Everywhere (056)	testing, analyzing water	some	some rivers streams watersheds	specific		some	several	some	
Water Wise (057)	overall water curriculum	several	some streams	some		some	specific	specific	specific
Water Wizards (058)	water distribution, conservation	specific		some	specific	specific			
Water Worlds (059)	water science, ecology	specific			specific				
What is Water? (060)	marine science, ecology	some	several Chesapeake Bay		specific	specific		some	several
Wise Water Ways (061)	water conservation	some	specific Colorado River Lake Mead	some					
WOW! The Wonders of Wetlands (062)	wetland ecology	some	some			several	some	some	specific

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		specific	some			2-6	manual		indoor	Sci M
		some	several	specific	specific	9-10	manual	information packet	indoor	Sci M
	some	some	some	specific	some	K-3	binder		indoor	Sci SS M LA Art
	some	some	some	several	some	4-6	binder		indoor field	Sci SS M LA
	some	some	several	some	some	2-4	manual	video newspaper	indoor field	Sci SS M LA Art
		specific	some		specific	7-8 activity	manual	activity	indoor	Sci SS M
	some	several	some	several	some	5	manual	poster field	indoor	Sci M LA
	several	specific	several			7-12	manual reference unit	text	indoor field	Sci SS M
	several	some	some		specific	5-6	manual		indoor field	Sci SS M LA
		specific	specific			3-4	manual activity masters		indoor field	Sci SS M
	some		some			3-6	packet	member guide	indoor	Sci field
	some	some		several	some	4-6	leader guide	member guide	indoor	Sci SS M LA Art
						2-4	manual	activity book	indoor	Sci SS M Art
	some	several	several	several	several	K-12	manual		indoor field	Sci SS M LA Art

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Author: Elaine Andrews is an environmental education specialist with the Environmental Resources Center, College of Agricultural and Life Sciences, University of Wisconsin-Madison, and the University of Wisconsin-Extension, Cooperative Extension.

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